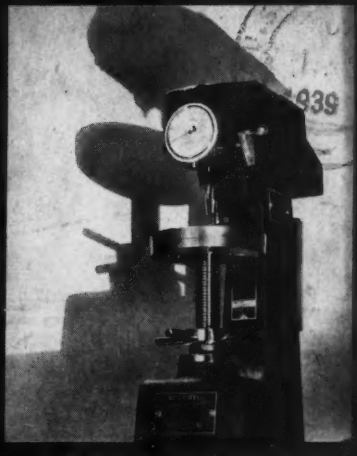
November, 1939

MODERN Machine Shop

THOSE WHO MAKE HARDNESS INSPECTION TESTS ARE BUILDING GOOD WILL...FOR THE ONLY FOUNDATIONS OF GOOD WILL IN BUSINESS ARE GOOD PRODUCT AND FAIR DEALING

"ROCKWELL"
HARDNESS TESTER



WILSON
MECHANICAL INSTRUMENT CO., INC.
Concord Avenue, N. Y. City

A NEW DUAL PURPOSE
TWO *in* ONE POWER CHUCK

SLASH INSTALLATION AND PRODUCTION COSTS WITH
THIS NEW 2 and 3
JAW POWER CHUCK

TWO CHUCKS for practically the price of ONE — that's an important saving but not the largest one. This new "TWO in ONE" LOGAN Power Chuck is quickly and easily converted into either a two jaw or three jaw chuck by simply shifting the false jaws. There is no loss of time caused by changing chucks. That's the REAL SAVING! Made in sizes from 12" up with Universal, Combination or Serrated step-a-long jaws. Write now for complete information.

"LOGAN"

LOGANSPORT MACHINE INCORPORATED
801 PAYSON ROAD • LOGANSPORT, INDIANA
Manufacturers of Air and Hydraulic Devices, Chucks, Cylinders, Valves, Presses and Accessories

SMALL IN SIZE . . .
GREAT IN PERFORMANCE

Modern bench lathes with Timken Bearing Equipped spindles are limited in usefulness only by the maximum size of the parts that can be handled on them. There is no limit to the precision work they can produce.

Mounting the spindles of bench lathes on TIMKEN Bearings has given these machines a definite place in production. Many parts that it would not pay to put on large lathes can be turned out economically on Timken Bearing Equipped bench lathes.

There may be many operations in the manufacture of your product that could be profitably done on modern bench lathes. It will pay you to check up on this. And be sure to specify "Timken Bearing Equipped" when buying.

THE TIMKEN ROLLER BEARING CO., CANTON, OHIO

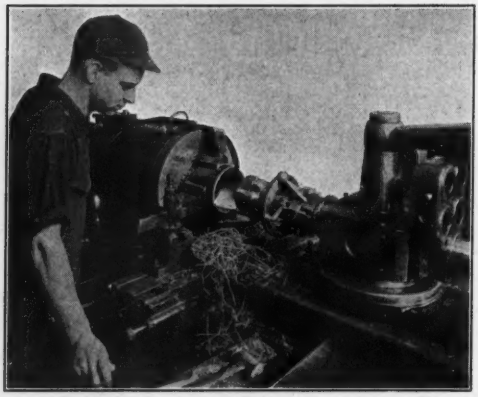
Brown Bench Lathe equipped with TIMKEN Bearings on the spindle.

FOR THE ULTIMATE IN MODERNIZATION

LANDI your THREADS

LANDIS Style LM Collapsible Taps

increase Production and assure Threads of Correct Taper and Proper Size



It is not often that the replacement of a single tool in a set-up will increase production 100%, but that is what happened when a west coast manufacturer applied LANDIS Style LT Collapsible Taps to the tapping of column couplings.

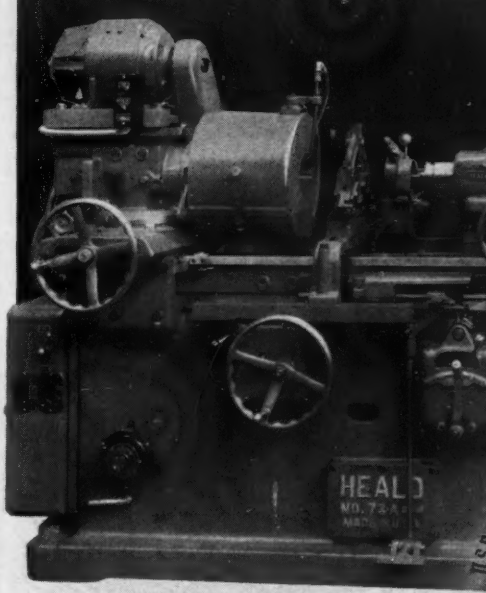
On a typical coupling, made from extra heavy coupling stock, a 7" diameter, 12 pitch thread, 6" long, the actual tapping time is 2 minutes. This LANDIS Tap reduced complete machining time from 24 minutes to 12 minutes per piece.

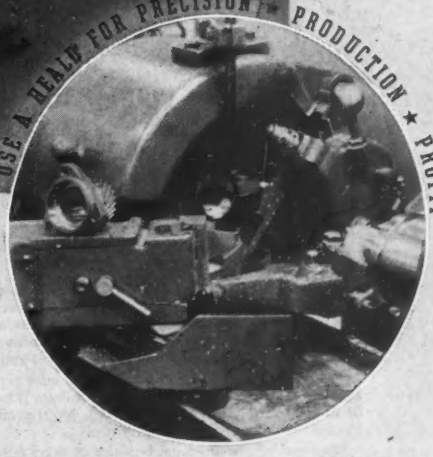
LANDISize your THREADS

Send for Bulletin No. G-81 Covering
LANDIS Style LM Receding Chaser Collapsible Taps

LANDIS MACHINE CO., Inc.
WAYNESBORO, PENNA.

AN ALL PURPOSE INTERNAL GRINDING MACHINE





While many of our machines are used by manufacturers for mass production, it is equally true that large numbers are sold for miscellaneous work such as found in tool rooms or on a variety of parts in small lots.

Above is a No. 72A Plain Internal ideally arranged for general work. In fact, it is almost a universal tool. To mention one or two units:

- Individual motor drive for wheelhead, workhead and hydraulic system.
- Hydraulic controlled movement for table. Cross slide under workhead.
- Hand feed for table. • Steady rest for long work.
- Dial Indicator for automatic sizing of work. (See close-up)
- Universal holding fixtures with capacity for various sizes of work can be supplied.

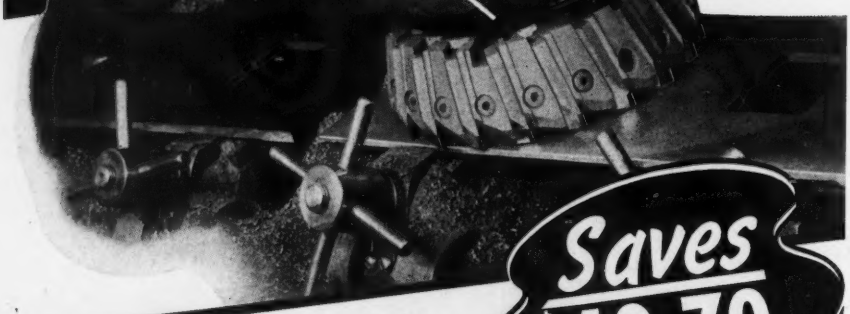
Above Heald arranged with Dial Indicator for Sizing is grinding a 2.000" diameter counterbore and the bottom face in an automobile transmission gear.

And remember this is only one of a complete line of internal grinding machines. Whatever your particular requirements, there is sure to be a Heald just suited to handle them.

THE HEALD MACHINE CO., WORCESTER, MASS.

Hidden Profits

Bring EXTRA Dividends to LIGHT Machinery Mfr.



THIS CARBOLOY-TIPPED CUTTER . .
(For Face Milling Sewing Machine Bed)

Saves $40.70 every 128 pieces

75% production increase—200% increase in pieces per grind—combined roughing and finishing operations—all these spell EXTRA PROFITS for this light machinery manufacturer. When you use Carboloy tools you are in a position to get these savings plus other "hidden" profits in the form of savings from less downtime, less scrap, better finish, greater accuracy, lower tool cost per piece, and less tool grinding time.

These savings are not confined to quantity production jobs alone. Nor are they limited to new, modern machines. Whether your runs are large or small, your equipment new or old, you'll profit through these "Hidden Profits" when you use Carboloy tools.

Write today for 24-page booklet of facts entitled "Hidden Profits In Your Machine Shop."

The Mark of CARBOLOY

Send for this unusual story of machine shop savings. Gives performance data on 30 typical jobs.

CARBOLOY COMPANY, INC.
11143 EAST 8-MILE STREET DETROIT, MICHIGAN

CHICAGO • CLEVELAND • NEWARK • PITTSBURGH • PHILADELPHIA • WORCESTER, MASS.
Canadian Distributor: Canadian General Electric Co., Ltd., Toronto

CARBOLOY CEMENTED CARBIDE TOOLS

MODERN Machine Shop

HOWARD CAMPBELL, Editor

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(Entered as third-class matter at Cincinnati, O., under Section 574½ P.L.&R., Act of June 5, 1934)

Circulation This Issue More Than 28,500

You
SAVE WITH A New CINCINNATI

KNOW It's A Good Cutter Grinder

HALF a century of building, using, selling all over the world is the story of the CINCINNATI No. 2 Cutter and Tool Grinder. For further proof of valve, check these features:

1. New table slide that rolls on balls. Made of hardened, heat-treated steel, instead of cast iron. Ways are ground in position on the table, assuring absolute accuracy.
2. Duplicate rear controls for table movement and vertical adjustment of grinding wheel head.
3. Headstock and tailstock with clearance setting dials for correct angular settings.
4. New type of anti-friction spindle mounting.
5. Universal headstock, ready for either B. & S. or National Standard Milling Machine taper shank cutters (3½" per foot). Headstock spindle mounted on anti-friction bearings.
6. Simplified, convenient tooth rests.
7. Shock-absorbing cushioning table stop dogs.
8. Enclosed motor drive. Rugged boxed type bed. Fixed height table and operating position.

This is why CINCINNATI Cutter Grinders save 15% to 25% in cutter sharpening time for their users, and why they will for you, too. Write today for Catalog M-777.

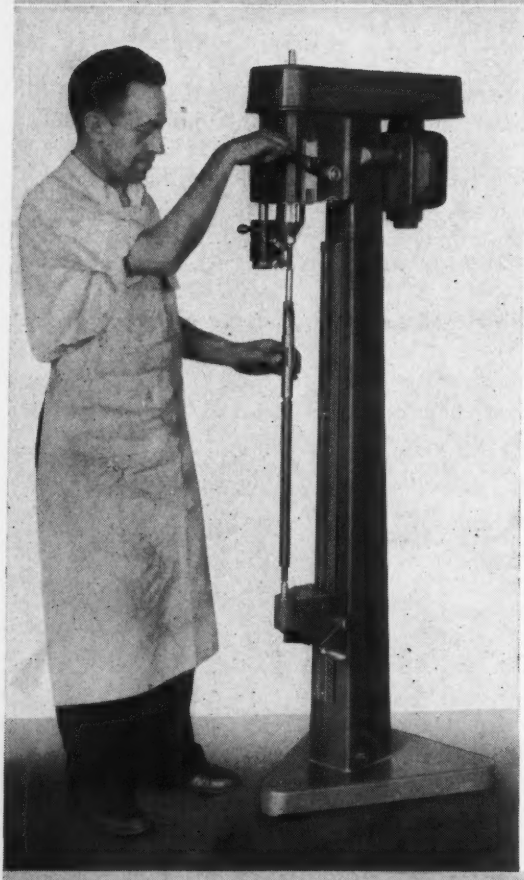
CINCINNATI No. 2 Cutter and Tool Grinder

THE CINCINNATI MILLING MACHINE CO.

CINCINNATI

HOW TO GET GREATER ACCURACY AND SMOOTHER FINISH FROM YOUR PRESENT O. D. GRINDING EQUIPMENT . . .

Improved Ex-Cell-O Machine Laps Work Centers Quickly and Inexpensively



Female centers, in parts held between centers and ground on the outside diameter, are easily and economically lapped on the improved Ex-Cell-O Center Lapping Machine. Parts with true, smooth centers can more readily be ground straight, round, concentric, and with good finish.

•

The machine has ample capacity, lapping 60° centers up to 15/16" diameter in parts up to 10" diameter, 36" long (or, with a special column, 84" long). Lapping speeds are 700, 1300, 2500 and 4650 r.p.m.

•

Lapping stones are mounted on an Ex-Cell-O Precision Ball Bearing Spindle, which has minimum end and radial play, does not generate excessive heat, and will stand up without replacement or adjustment.

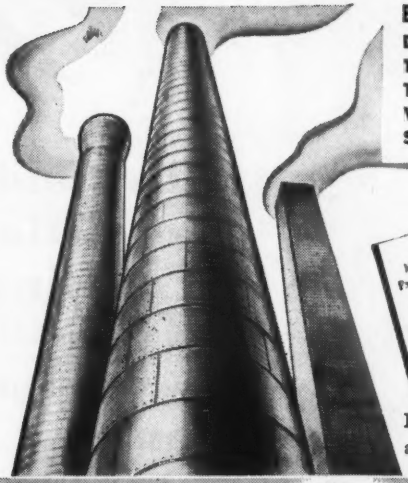
•

Many other features of the Ex-Cell-O Center Lapping Machine are fully described in Bulletin No. 20783, which also gives complete specifications. Write for a copy.

XLO

EX-CELL-O CORPORATION
1206 Oakman Blvd., Detroit

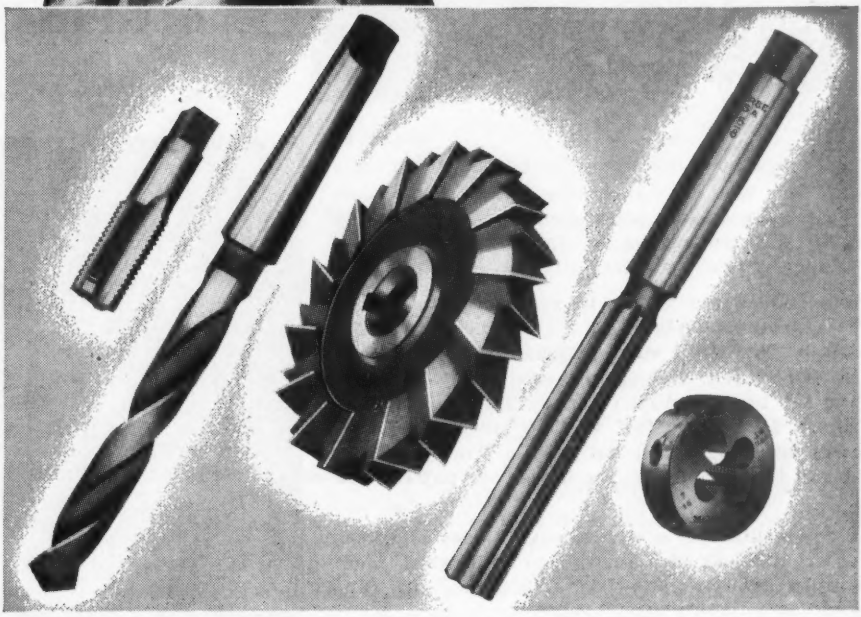
EX-CELL-O Precision MACHINES for CENTER LAPPING • TURNING • TOOL GRINDING • BORING • FACING REAMING • DRILLING • THREAD GRINDING • COUNTERBORING
AND TOOLS for SURFACE GRINDING • COUNTERBORING • FACING • MILLING • TURNING BROACHING • FORMING • BORING • INTERNAL GRINDING • REAMING



BENEATH NEARLY EVERY SMOKESTACK DRILLING, REAMING, MILLING AND THREADING ARE MAJOR OPERATIONS.. THE QUALITY OF THE TOOL AT THE WORKHEAD CONTROLS PRODUCTION SPEED AND PRODUCTION COSTS.

FREE MACHINISTS' GUIDE

Write for your copy of "Machinists' Practical Guide"... it's yours for the asking! Contains 55 pages of information on Drill Grinding, Cutting Speeds, Decimal Equivalents, etc. Handy vest-pocket size. Please give name and firm by whom you are employed.



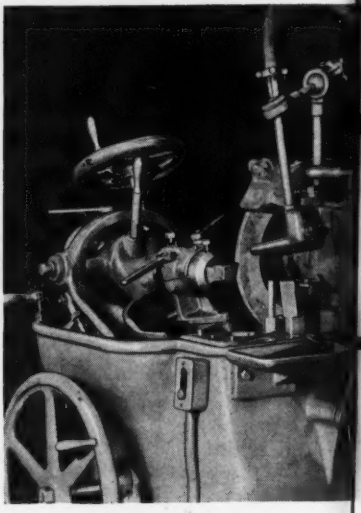
MORSE THERE IS A DIFFERENCE **TWIST DRILL AND MACHINE COMPANY**

NEW BEDFORD, MASS., U. S. A.

NEW YORK STORE: 130 LAFAYETTE ST. - - CHICAGO STORE: 570 WEST RANDOLPH ST.

Why hold up production by putting skilled machinists on Tool Grindin

Sellers 20W Tool Grinder



OF course, machinists like to grind their own tools . . . they also have their own ideas of how tools should be shaped and what clearance they should have. All of them cannot be right—a machinist at best seldom grinds two tools alike.

Why pay skilled machinists to grind tools? An expensive machine stands idle . . . production is held up! Have your tool room attendant do this job. With a Sellers Tool Grinder, he can grind tools better than the best machinist can by hand . . . and in less time. Less tool steel will be wasted and the tools will last longer and cut better. And your machinist can be kept on the work you are paying him to do.

If you are looking for a way to save money and keep production at peak, we know you will want more information about Sellers Tool Grinders.

William Sellers & Co., Inc.
1614 HAMILTON ST. PHILADELPHIA, PA.

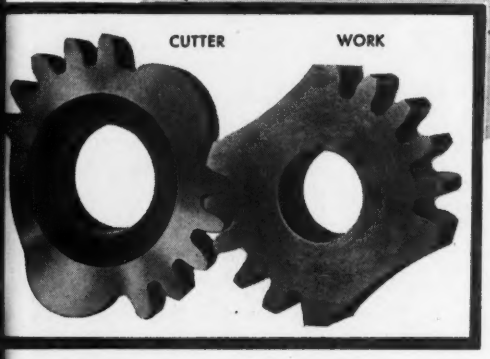
FOUNDED SELLERS 1848

Sellers

Combination Profiles in *One* Operation

ON THE GEAR SHAPER

Cam profile and involute gear teeth cut by a single Fellows cutter in one operation.



This cutter generates the involute gear teeth and the semi-circular portions of this Geneva stop in one operation.

(Large illustration above) —Segment gear with row of involute gear teeth and a separate row of ratchet teeth all cut in one operation.

THE versatility of the Fellows Method is forcefully emphasized on work where combination profiles are combined in a single cutter. The outstanding advantages are: precision output indefinitely duplicated; one setup instead of several; all elements in fixed relative positioning. High speed production—and low costs . . . . . If you have gear or irregular profiling problems, let us counsel with you. No obligation. Write either office.

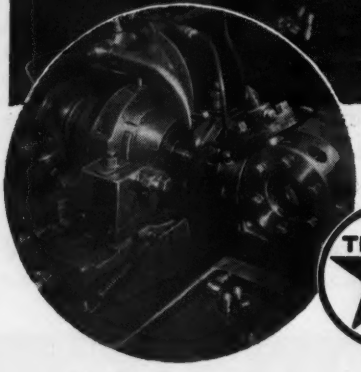
THE **FELLOWS** GEAR SHAPER COMPANY

Springfield, Vermont or 814 Fisher Building, Detroit, Michigan

CLOSER LIMITS

FINER FINISH

LONGER TOOL LIFE . . .



Above: **SUPT. WALLAR,** of the Henderson Co., checking work from one of his screw machines. *Left:* **CLOSE-UP VIEW** of operation which has improved greatly since using Texaco Sultex Cutting Oil.

TEXACO

TEXACO

. . FROM THESE B & S SCREW MACHINES

THESE BROWN & SHARPE Automatic Screw Machines, in the Henderson Company, Batavia, Ill., today produce more work, to closer limits, with better finish. Not only this, the tools last longer.

The only change made to bring about these improvements was to use Texaco Sultex Cutting Oil.

When using various other cutting oils, a deposit was built up on the bronze gibs, requiring removal of the slides 3 to 4 times each week.

Going over to Texaco Sultex Cutting Oil, this trouble was entirely eliminated resulting in increased output. You, too, can get better results with Texaco Sultex.

Experienced lubrication engineers, trained in the selection and application of Texaco Cutting and Soluble Oils, will be glad to demonstrate that savings can be made with Texaco Perfected Lubrication.

For prompt engineering service and deliveries, phone the nearest of our 2279 warehouses in the U. S., or write:

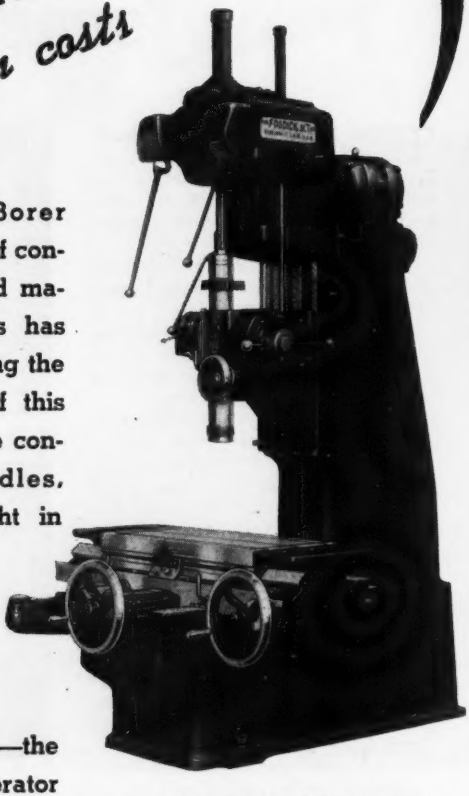
The Texas Company, 135 East 42nd Street, New York, N. Y.

GENERAL VIEW of the B & S Screw Machines that never need dismantling because with Texaco Sultex, their gibs never gum.

Texaco Dealers invite you to tune in The Texaco Star Theatre—a full hour of all-star entertainment —Every Wednesday Night—Columbia Network—9:00 E.S.T., 8:00 C.S.T., 7:00 M.S.T., 6:00 P.S.T.

Sultex Cutting Oils

CUT SMALL LOT *production costs*

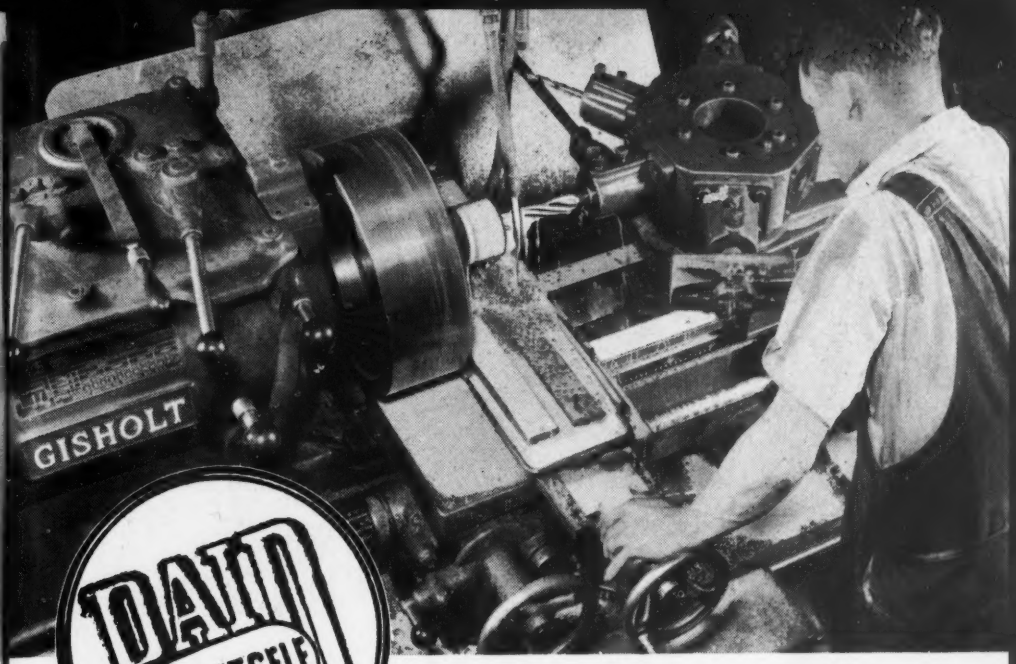


The Fosdick Jig Borer matches the precision of considerably higher priced machines. "Good news has traveled fast" concerning the superb performance of this tool. Operators like the convenient control handles, which are placed right in front of them to prevent lost motion, and other easy operating features.

This is one machine that pleases every one—the manufacturer, the operator and especially — the purchaser.

SEND FOR COMPLETE INFORMATION

FOSDICK MACHINE TOOL CO.
CINCINNATI, OHIO • U. S. A.



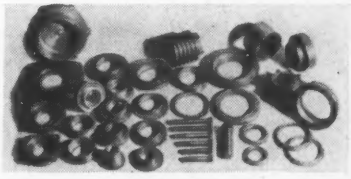
PAID FOR ITSELF

IN SIX MONTHS

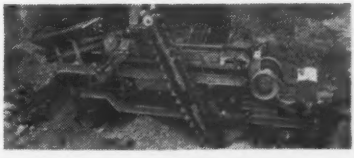
—machining these miscellaneous small parts

● Here is a "spare time job" that paid for a machine in only six months! This manufacturer installed a Gisholt No. 5 Ram Type Turret Lathe to machine a particular part for portable rock crushers. The new machine did the work so much faster than heretofore that its spare time was turned to machining small parts formerly purchased from outside sources. Savings on these parts as shown, ranged from 30% to 70% of former cost. In fact, the savings on this work alone paid for the machine in six months.

Such savings are typical of what the new Gisholts are doing in many plants. Probably there are similar hidden profits for you in your plant. A Gisholt engineer will be pleased to help you locate them. Ask to have him call.



★ *These small parts, machined on the new Gisholt, are used in this portable rock crusher.*



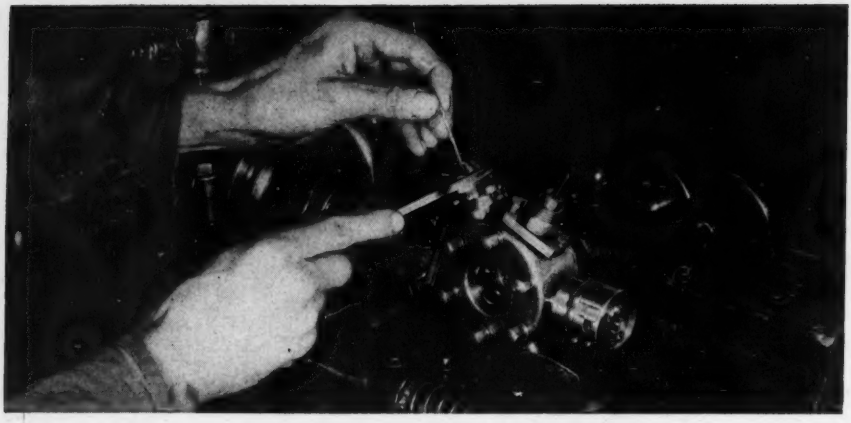
"YOUR SMARTEST INVESTMENT TODAY—BETTER MACHINE TOOLS"

GISHOLT

GISHOLT MACHINE COMPANY

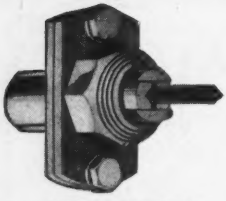
1219 EAST WASHINGTON AVENUE, MADISON, WISCONSIN, U. S. A.

TURRET LATHES · AUTOMATIC LATHES · TOOL GRINDERS · BALANCING MACHINES



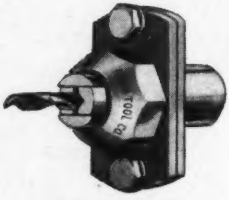
Save Set-Up Time--

Simplicity - Efficiency - Speed



DRILL CHUCK

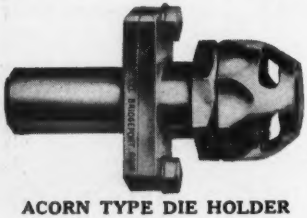
WITH ALCO Drill Chucks and Tap Holders, one wrench and a simple twist of the wrist is all that is necessary to change the size of a drill or tap. You don't have to bother about bushings. None are necessary. Forget your bushing headaches and expense. Liquidate your heavy bushing inventory.



TAP HOLDER

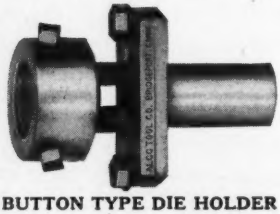
And it's just as easy to adjust for *absolute concentricity*—with all four of the ALCO Tools illustrated. The floating feature is exclusive. The adjustment is positive.

Equip all your screw machines with ALCO Tools. You'll find it an economy, not an expense. They'll fit any screw machine—old or new—and, even on old machines with badly worn bearings, you can produce accurate work . . . perfect threads, perfect holes. Eliminate heavy rejection expense. Many users have even done away with inspections.



ACORN TYPE DIE HOLDER

For detailed information, or for a call from our representative in your locality, write today to Alco Tool Co., Bridgeport, Conn., U. S. A.



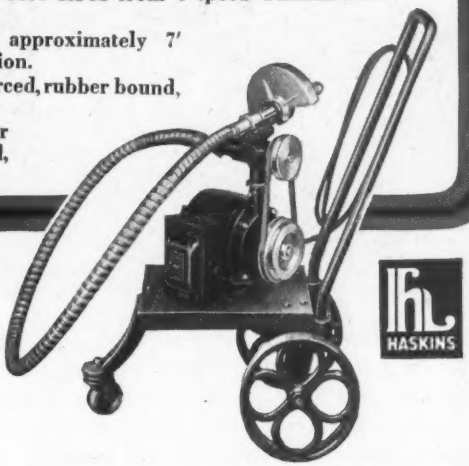
BUTTON TYPE DIE HOLDER

ALCO EFFICIENT TOOLS

BETTER ENGINEERED to do a BETTER JOB!

HASKINS FLEXIBLE SHAFT EQUIPMENT TYPE HS-7

MOTOR—Full 1 HP, ball bearing open type, 1725 RPM.
SPEEDS—975, 1275, 2200, 3100 RPM from 4 speed Timken bearing countershaft.
CORE—⅝" diameter by approximately 7' long, heavy duty construction.
CASING—Improved reinforced, rubber bound, 360° swivel at spindle end.
SPINDLE — Timken roller bearing, accurately balanced, dust and grease sealed.



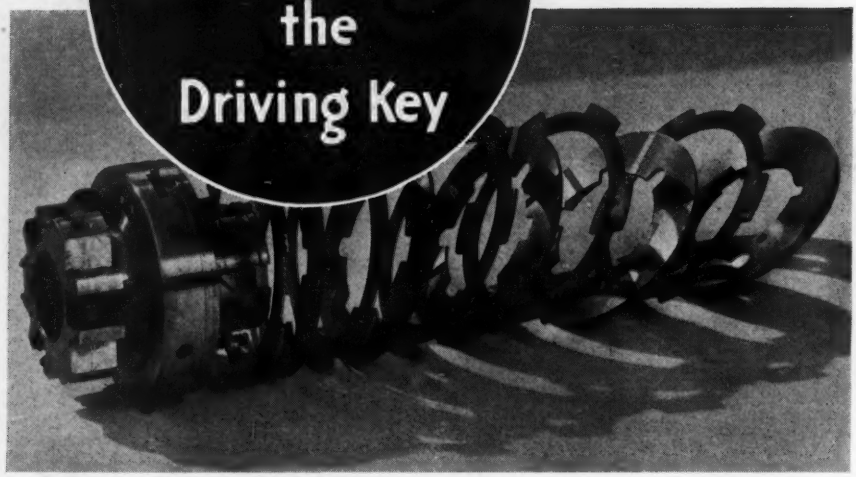
TAKE HS-7 to your toughest jobs —and take it in a hurry. You won't have to baby it over the rough floor of the foundry. It won't mind the bumps and jolts it gets in the equipment yard. For HS-7 is built to do the heaviest and hardest kind of grinding, sanding, wirebrushing and polishing *faster and at a lower cost per job —and to keep on doing it year after year!* Like all Haskins Flexible Shaft Equipment, it is honestly made and sold, backed by the reputation and integrity of the respected name it bears.

WHICH TYPE FOR YOUR PLANT? There are more than 25 different types of Haskins Flexible Shaft Equipment—as versatile in application as varied in price. All are described in a free booklet that may give you a money-saving idea. Write for it. R. G. Haskins Company, 619 S. California Ave., Chicago.

HASKINS *Versatile* FLEXIBLE SHAFT EQUIPMENT

EUROPEAN REPRESENTATIVE—G. E. MARBAIX, LTD., HUMGLAS HOUSE, LONDON, S. W. I.

Driven Plates don't cut into the Driving Key



In Twin Disc MT Clutches, both "dry" and "in oil" types, the driven plates are of saw steel, heat treated and ground. They are driven by hardened keys, set in keyways in the clutch hub. ¶ This construction not only provides accurate location of the driving key but prevents the cutting of the driven plates into the driving key. Another detail that assures longer life and better performance of Twin Disc Machine Tool Clutches. ¶ Why not ask our Engineering Department for detailed description of Twin Disc MT Clutches and find out for yourself why so many production men say "Twin Disc Machine Tool Clutches make a good machine better."

TWIN DISC CLUTCH COMPANY · 1326 RACINE STREET · RACINE, WISCONSIN

JARVIS

Tapping Attachments

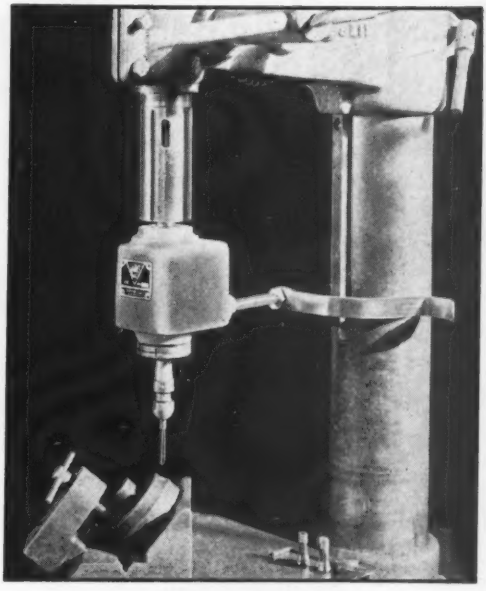
JARVIS BIAX

These high speed, all bearing attachments are standard equipped with neutralizing device which keeps the chuck in neutral position when tap is not actually engaged.

Additional equipment includes longitudinally adjustable spring locking side rods which eliminate vibration. Also single purpose, positive grip collets.

Jarvis Tapping Attachments are entirely ball bearing equipped with forward and reverse friction and double reverse speed. Let us prove to you that you can save money with Jarvis Tapping Attachments.

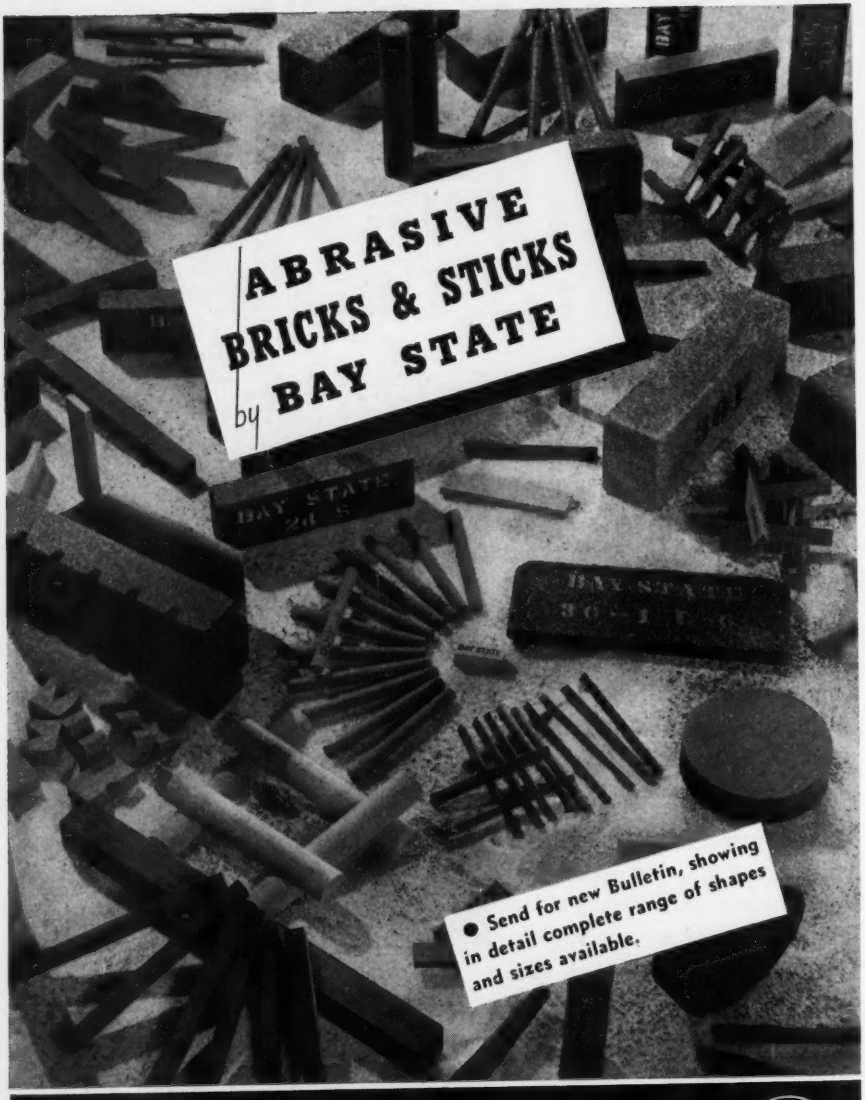
Write for Catalog T-5



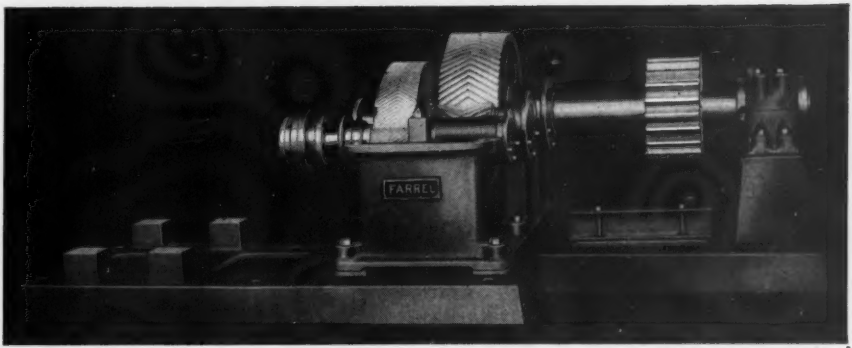
We will demonstrate the above Jarvis Tapping Attachment to you. Ask us.

Jarvis Tapping Attachments are available from No. 2 to 2" capacity

CHAS. L. JARVIS CO.
MIDDLETOWN CONN.


ABRASIVE
BRICKS & STICKS
by BAY STATE
● Send for new Bulletin, showing in detail complete range of shapes and sizes available.

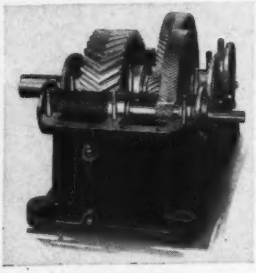
BAY STATE ABRASIVE PRODUCTS CO.
WESTBORO, MASSACHUSETTS



Type DR Unit with low speed shaft extended, assembled with motor bed and outboard bearing.

FARREL GEAR UNITS

Built for Efficient Lasting Performance



Triple reduction unit, ratio 136:1. Note compactness of drive, with the output shaft in line with first intermediate shaft.

Here is a handbook of valuable information for all gear users, giving specifications, dimensions and ratings. Send for Catalog No. 438.

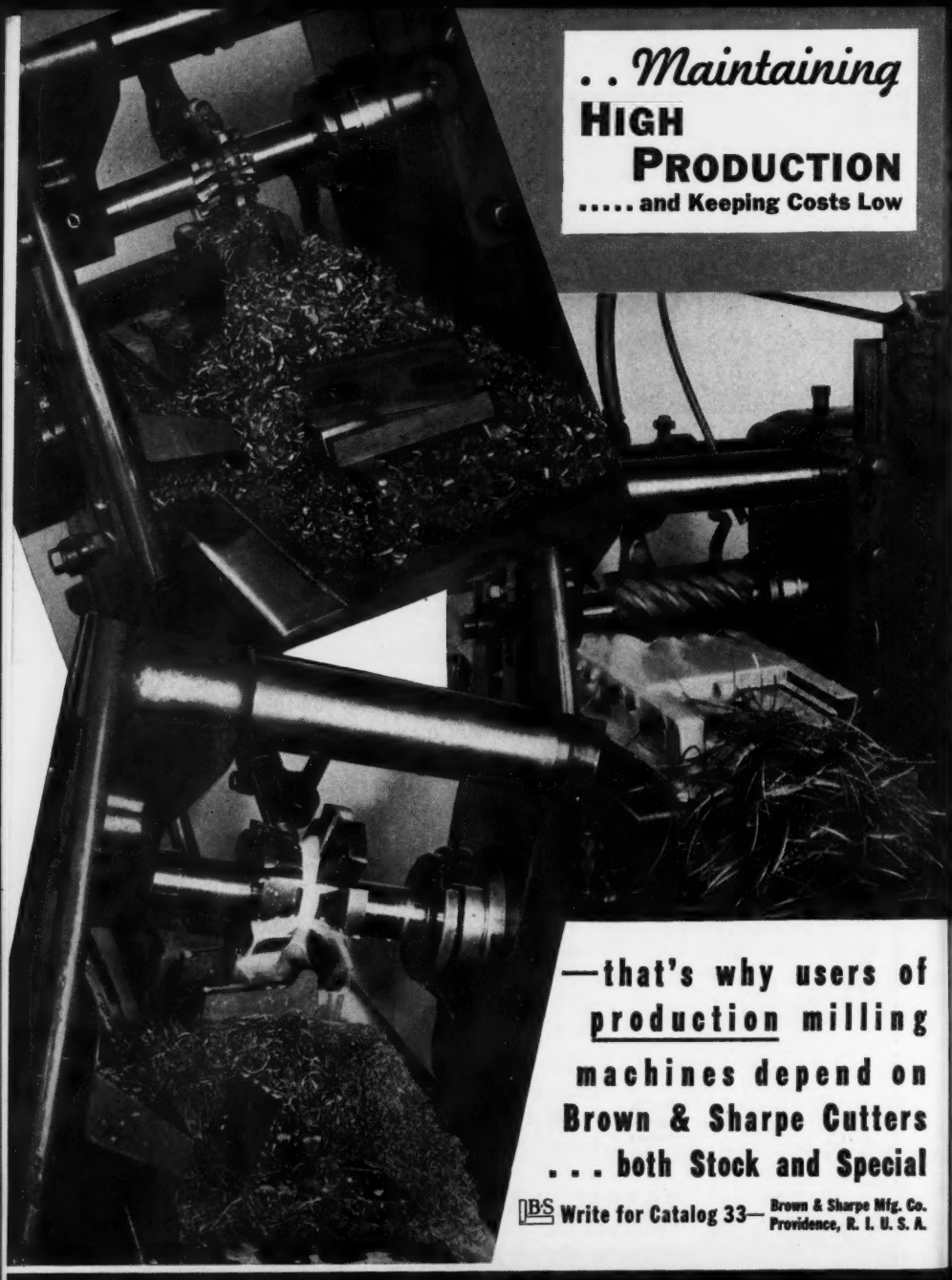
The long-lived efficiency, durability and satisfactory performance of Farrel Gear Units are due chiefly to these features: precision-generated, continuous tooth herringbone gears, proportioned for extra strength and load-carrying capacity to withstand shocks, stresses and wear; anti-friction roller bearings holding the gears in permanent alignment; rigid mountings that eliminate vibration and deflection; and an effective lubricating system.

Farrel Gear Units are designed to allow latitude in proportioning their gears to specific conditions of load, speed and service, a flexibility permitting engineering exactness in gear detail.

The complete series of self-contained, totally enclosed gear units meets every requirement for smooth, quiet and efficient power transmission.

FARREL SYKES GEARS

FARREL-BIRMINGHAM COMPANY, Inc.
381 VULCAN STREET - - - - - BUFFALO, N. Y.
The Gear with a Backbone



. . *Maintaining*
HIGH PRODUCTION
. . . . . and Keeping Costs Low

—that's why users of production milling machines depend on Brown & Sharpe Cutters . . . both Stock and Special

BS **Write for Catalog 33—** Brown & Sharpe Mfg. Co. Providence, R. I. U. S. A.

BROWN & SHARPE

MACHINE OF THE MONTH

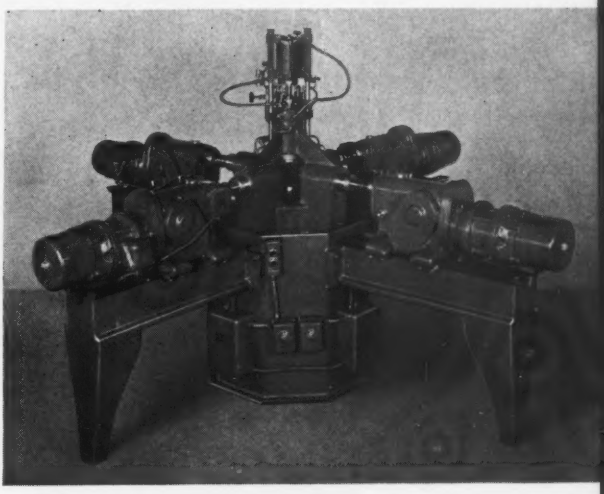
PREPARED BY THE SENECA FALLS MACHINE CO. "THE Lo-swing PEOPLE" SENECA FALLS, NEW YORK

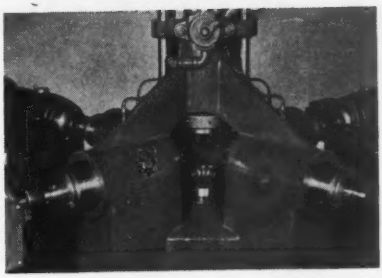
SPECIAL 4-WAY CENTERING MACHINE FOR PRECISION WORK UTILIZES STANDARD HEADS

Problem: To provide a volume production machine for *accurately* centering the four ends of a universal joint journal or "spider." Essential that an absolute 90° angle be maintained between all four center holes.

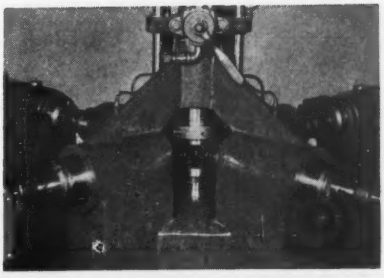
Solution: In order to insure the essential accuracy, this machine was designed with a special fixture carrying four spindles in an integrally-cast center unit. Each of these spindles is direct-connected, thru a floating drive, to a Standard Star Drilling and Centering Head. The Heads provide the rotating and feed movements.

The work is accurately located and held by an air-operated equalizing fixture. A single starting button puts the machine thru its cycle automatically with all Heads operating simultaneously.



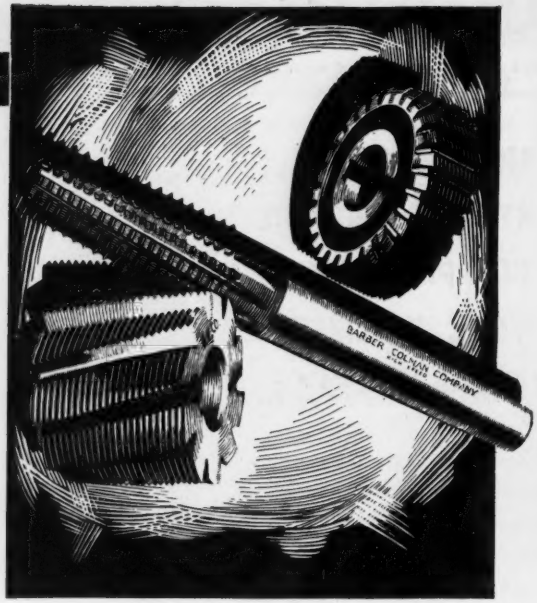


• *Work placed in position on equalizing fixture. Operator now throws air valve and pushes starting button.*



• *Machine has now completed its cycle. Operator now throws air valve and removes finished work.*

THREAD MILLS...



For Accuracy and Stamina

Buy **Barber-Colman Cutters**

The accuracy, delicate durable edges, true shape and pitch necessary in thread-milling cutters challenge the manufacturer . . . have no terrors for Barber-Colman. Pioneer and extensive experience in making Hobs, especially Ground Hobs, qualifies us unusually well to accept the challenge presented by the requirements of thread-milling or any other type of cutter . . To overcome the obstacles and difficulties . . To meet the most exacting requirements . . To win consistently in the battle for high accuracy and fine finish in the product, for long life between grinds in the cutters. In thread mills, end mills, plain mills, standard or special, Barber-Colman milling cutters are unexcelled for accuracy, stamina, and value. Investigate.

BARBER B-C COLMAN

PRODUCTS

MILLING CUTTERS, HOBS, HOBBING MACHINES, HOB SHARPENING MACHINES, REAMERS, REAMER SHARPENING MACHINES, SPECIAL TOOLS

BARBER-COLMAN COMPANY

General Offices and Plant ROCKFORD, ILLINOIS, U. S. A.

DEDICATED

To Raising The Standard of Living

ABROAD, human principle characterizes all Monarch planning—that of raising today's standard of living. And, we are practical enough to know that we can do our share toward achieving this goal by progressively developing Monarch lathes so that they help reduce costs and improve quality of merchandise—so that the Monarch lathes of today will adequately meet the profit demands which industry will present tomorrow.

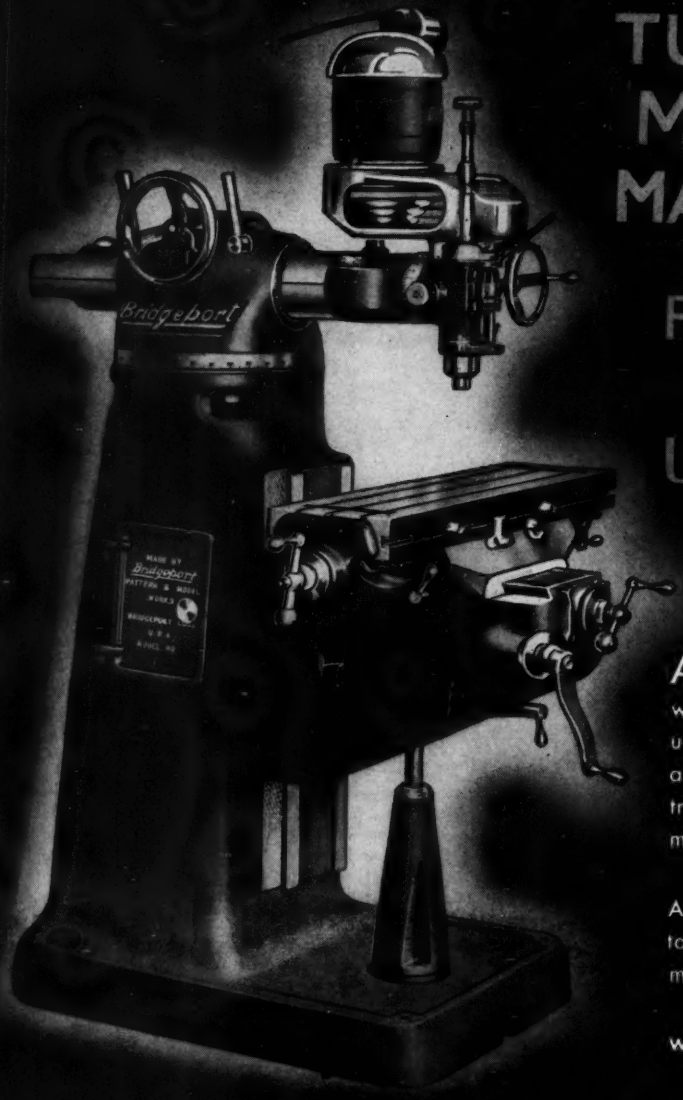
Monarch's enlarged manufacturing facilities are being taxed to the limit in order to meet the increasing demand from customers in the United States. Every effort is being made through day and night production, to satisfy every reasonable demand for more Monarch lathes. The Monarch Machine Tool Company, Sidney, Ohio, U. S. A.

IF IT CAN BE TURNED, MONARCH CAN LIKELY TURN IT BETTER AND FASTER

MONARCH LATHES
COVER THE TURNING FIELD

AGENCIES IN PRINCIPAL INDUSTRIAL CENTERS THROUGHOUT THE WORLD

Bridgeport



TURRET MILLING MACHINE

Flexibility
Rigidity
Unparalleled
Range

AN outstanding product weighing 1600 lbs. with unusual range for large tool and fixture work yet extremely sensitive for fine milling on molding dies.

Also, high speed milling attachments for all makes of milling machines.

Write for further details

BRIDGEPORT MACHINES, INC.
52 REMER STREET · BRIDGEPORT, CONN.

AGAIN! SHORT RUNS PAY on the WICACO CONTINUOUS OIL GROOVER

One of the finest Machine Tool Plants in New England cuts oil grooves in all types of bushings in lots of 1 to 300 on the Wicaco.

Although the Wicaco Oil Groover is used only a few hours a day, it is so much faster that it has paid for itself in less than 2 years—a 50% return on the investment.

Most bushings are cut with double figure-eight grooves in one minute elapse time.

SHORT RUNS or HIGH PRODUCTION

The Wicaco Oil Groover is essentially a high production machine, but its efficiency has enabled it to pay its way even on odd lot runs as indicated above.

Features of the Wicaco Oil Groover:

1. Upright construction of spindle and stationary chuck permits continuous loading and unloading the work without stopping the machine.
2. Revolving spindle and stationary chuck permit grooving of large, irregular pieces.
3. Automatic operating features enable operator to produce 500 or more pieces per hour.

Write for complete details.

71st Anniversary • Established 1868

The WICACO MACHINE Corp.

WAYNE JUNCTION • PHILADELPHIA, PA.

"These Low Cost Drill Are

$89.50

with motor pulley and belt but without motor.

MANY SPECIAL FEATURES IN THE DELTA 17-INCH DRILL PRESSES

Five speeds: 385, 600, 935, 1450, 2240 r. p. m. Floating Drive; Preloaded double-seal ball bearings; 16 tooth splined spindle; Table Raising gear; Head-Raising gear; Tilting or production table; Completely enclosed belt; Safety spring wind; Foot power feed. Overall dimensions: 66" high; 18" wide; 27" front to rear. Tilting table: 11" x 12". Production table: 12½" by 17" surface. Floor base: 10" x 13¼" table surface. Shipping weight: 340 lbs. Separate drill press heads available. Also high speed bench models and 2 spindle models.

Presses Saving My Hide"...

Because they not only enable me to cut costs—but I can get them NOW—without waiting months for delivery!

Manufacturers everywhere are telling us the same story—of how Delta drill presses are giving them an edge on competition.

We have scores of dramatic illustrations of this in our files. Here's why: Delta Drill Presses cut labor costs, increase flexibility, save on special set-ups. They give you durable precision machines at a fraction of the cost of heavy machines.

SEND FOR DRILL PRESS BOOK

Mail coupon for latest Delta Drill Press Book. It contains specifications and prices of complete line of Delta Drill Presses plus details on individual parts from which you can make your own low-cost assemblies.

DELTA
MANUFACTURING CO.
(INDUSTRIAL DIVISION)
667 E. VIENNA AVE.
MILWAUKEE, WISCONSIN

DELTA MFG. CO. (Industrial Division)
667 E. Vienna Avenue, Milwaukee, Wis.

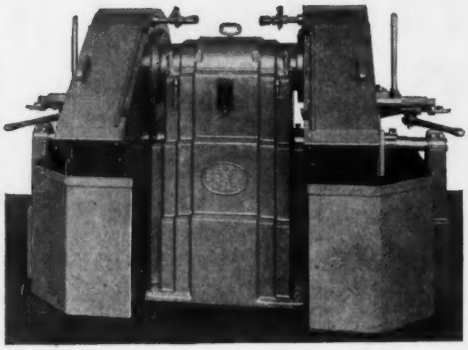
Gentlemen: Please send me your latest Delta Drill Press book which contains specifications and prices of your complete line of Drill Presses.

Name.....

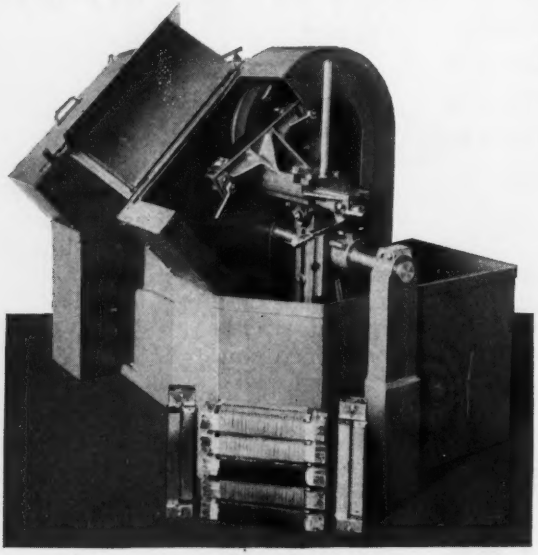
Address.....

City.....State.....

The Unusual BESLY GRINDER JOB



Illustrations show #210-18"-L Besly Wet Grinder especially equipped for grinding coils for electrical control. Operation consists of grinding enough Bakelite, cotton covering, insulating varnish and copper wire so as to properly expose the contact surface. • Not so unusual for Besly who in the last fifty years have furnished machines for grinding (in addition to most known metals) such materials as cork, rubber, terra cotta, fibre, catalin, Bakelite, refractories, glass, pottery, porcelain, building brick, ivory, paper, quarry and floor tile, etc. • Take advantage of this well rounded experience and put your flat surfacing problems up to us. Our knowledge gained through almost fifty years of Besly grinding is yours for the asking.



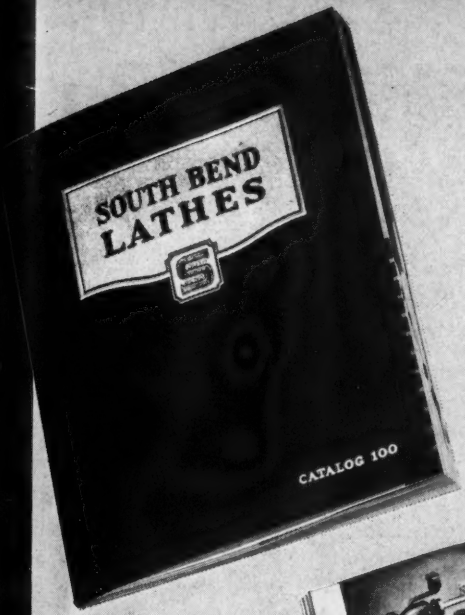
Note the efficient Water Hoods that properly confine the coolant.

Write for your copy of Booklet on Besly Titan Steelbacs.

CHARLES H. BESLY AND COMPANY

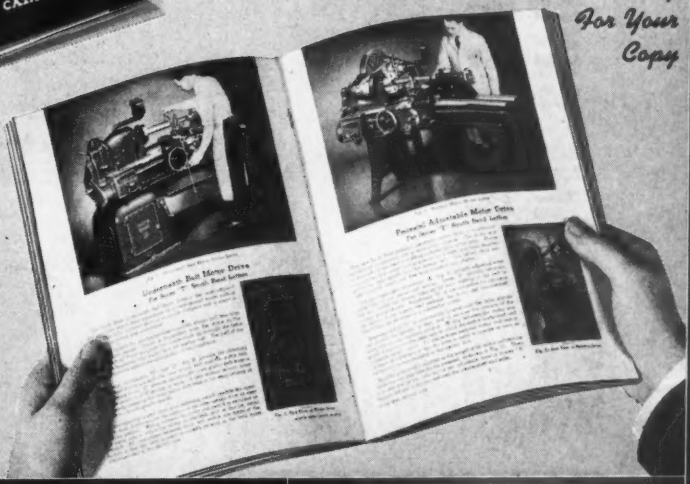
118-124 NORTH CLINTON STREET * CHICAGO, ILLINOIS

New Catalog *of* South Bend Lathes



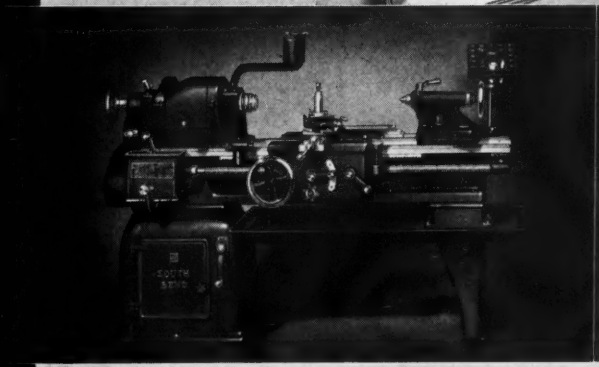
● This new catalog describing the entire line of South Bend Lathes, Chucks, Tools and Attachments is just off the press and is now ready for distribution. It is the most complete lathe catalog ever published. Never before have so many different sizes and types of lathes been illustrated in a single catalog. Every user of machinery should have a copy of this valuable catalog at hand for ready reference.

Write Today For Your Copy



Mailed on Request

A copy of this new South Bend Lathe Catalog No. 100 describing 9" to 16" Swing South Bend Lathes and accessories will be mailed on request to any address, postage paid, no obligation. Size 8½" x 11" for standard file. Contains 112 pages and 250 illustrations.



16" Tool Room Underneath Motor Drive Lathe

1" Collet, 9" Swing Precision Lathe

SOUTH BEND LATHE WORKS

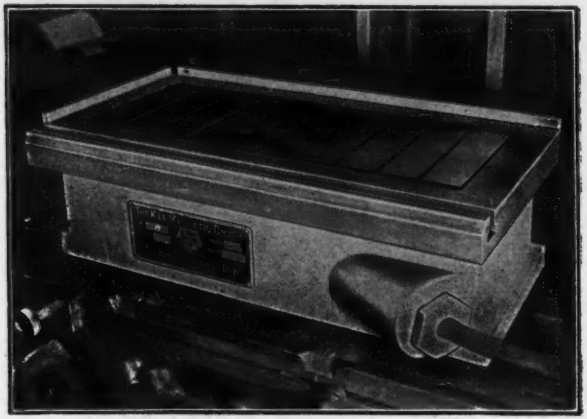
LATHE BUILDERS SINCE 1906

370 E. Madison St., South Bend, Ind., U. S. A.

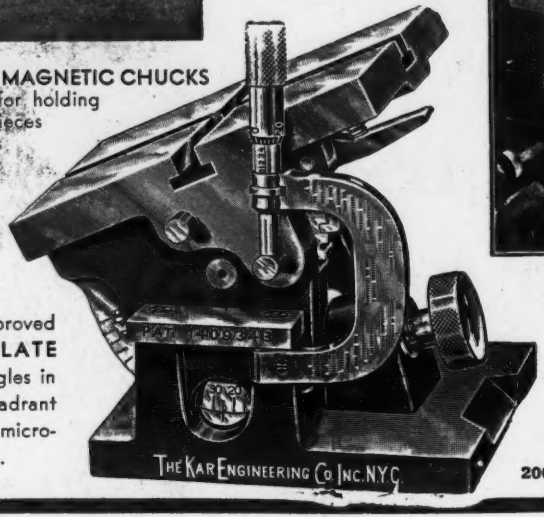
KAR TIME SAVING DEVICES

Increase PRODUCTION *decrease* COST

WRITE FOR LITERATURE



ACCESSORIES for MAGNETIC CHUCKS
Karnetic Parallels for holding irregular shaped pieces without special jigs and fixtures.



The new and improved **SINE ANGLE PLATE** measures exact angles in any part of the quadrant —only a two inch micrometer is necessary.

DEMAGNETIZE on the same chuck that held the work during a machine operation. No separate demagnetizer is necessary. A new and patented feature found only in **THE KAR DUO MAGNETIC CHUCK.**

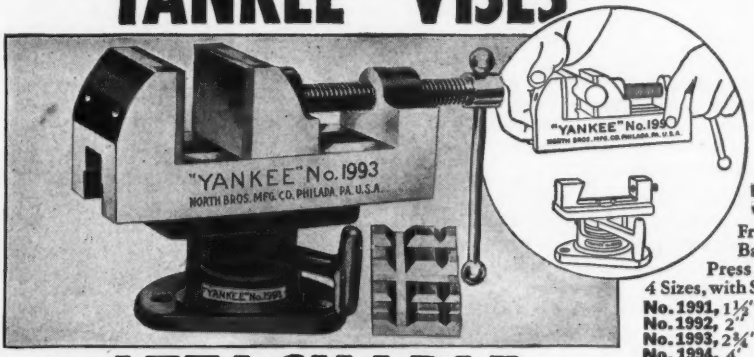
ESTABLISHED 1916

The KAR Engineering Co., Inc.
200 HUDSON STREET NEW YORK CITY

SAVE TIME!

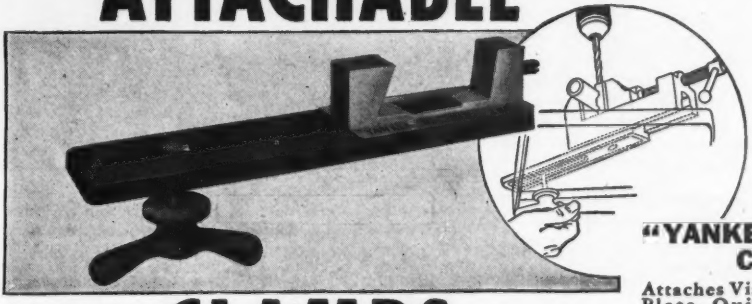
Accurately Machined
Sides, Ends, Base
Holds Work Square
Four Sizes
Without Swivel Base
No. 991, 1½" jaw width.
No. 992, 2" jaw width.
No. 993, 2¾" jaw width.
No. 994, 4" jaw width.

"YANKEE" VISES-



Removable with Work
From Swivel Base to Drill Press Face Plate
4 Sizes, with Swivel Base
No. 1991, 1½" jaw width.
No. 1992, 2" jaw width.
No. 1993, 2¾" jaw width.
No. 1994, 4" jaw width.

ATTACHABLE



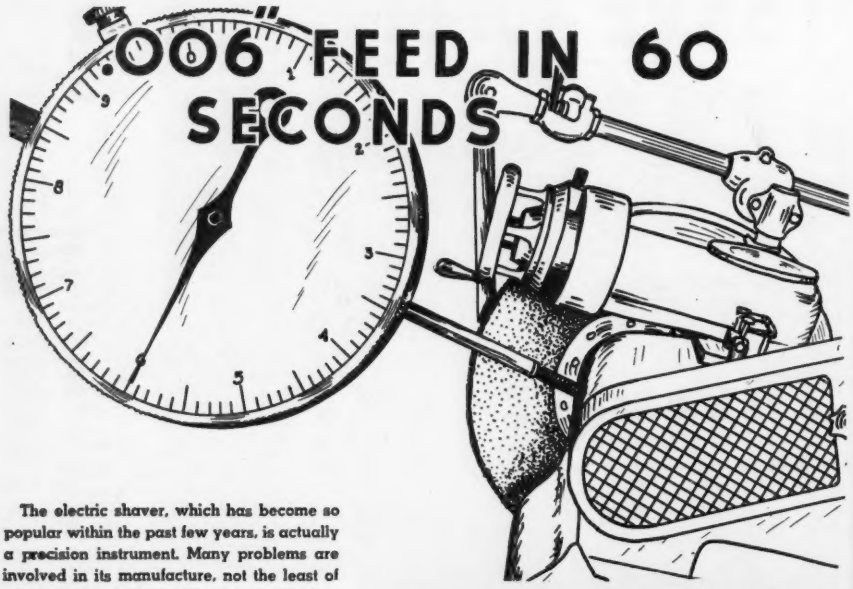
"YANKEE" CLAMP
Attaches Vise to Face Plate. Quick—Easy

CLAMPS

Two Sizes
No. 2992 for use with **No. 992** and **No. 1992**
No. 2993 for use with **No. 993** and **No. 1993**

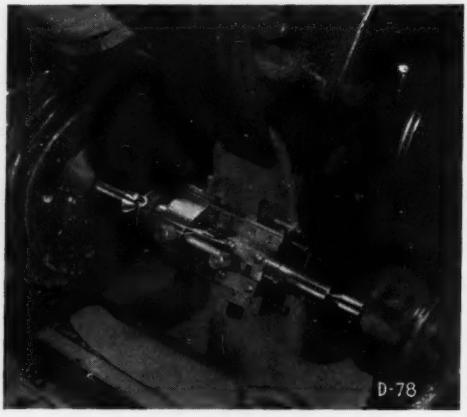
Order from your Supply House. For "Yankee" Vise Circular, write North Bros. Mfg. Co., Dept. M5, Philadelphia

.006" FEED IN 60 SECONDS



The electric shaver, which has become so popular within the past few years, is actually a precision instrument. Many problems are involved in its manufacture, not the least of which is the grinding of the shaving head.

One manufacturer has installed a Landis 6" x 18" Type C Plain Hydraulic Grinder to grind the radius on the top of this head. Only .003" stock is removed during the finishing operation and the greatest care must be exercised because the final thickness of the two outer edges of the head is only .002". In order to efficiently grind this part, an exceedingly slow wheel feed must be used. The Landis hydraulic straight infeed has proved itself ideal for the job as it is enabling this user to feed in but .006" over a period of sixty seconds. Fine grinding feed, incidentally, is brought into play before the wheel has fed up to the work because the wheel would burn the work if it were to come into contact with it during the rapid infeeding movement.



Not many grinding machine users will ever require infeeding movement as slow as this electric shaver manufacturer. What should be remembered is that absolutely correct design and the best in manufacturing craftsmanship are required in order to produce a machine which will so perform. Every Landis grinder, regardless of the operation it is intended for, has this same background.

No. 302

LANDIS TOOL COMPANY

WAYNESBORO, PENNSYLVANIA

200 Tons a Week—

HANDLED BY YALE LIFT TRUCKS

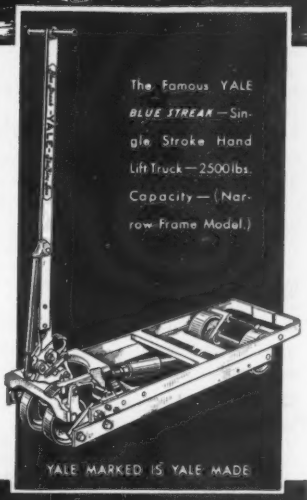
200 tons of corrugated boxes a week—a lot of paper for any trucks. But that's the job that YALE Lift Trucks perform for the Great Southern Box Company every week in the year. And perform perfectly!

Following are some excerpts from a letter written by Mr A O'Shaughnessy, Vice-President of the Great Southern Box Company:

"The YALE system of hand lift trucks and skid platforms is the most efficient system of handling our product that we know of. We could not do without it. Maintenance cost is remarkably low—practically nothing. The Blue Streak is the easiest and fastest truck to operate that we have ever used. It is impossible to get a 'flying handle', and we have never had an accident of any kind. *You cannot improve on YALE service.*"

"You Cannot Improve on Yale Service"—the keynote of YALE success! Every truck that leaves our plant is the best of its kind. The safest—the most economical—the most efficient. Profit by the experience of industrial executives like Mr. O'Shaughnessy. BUY YALE!

Look in the phone book for your nearest YALE representative.



TRADE YALE MARK

THE YALE & TOWNE MFG. CO.
PHILADELPHIA DIVISION, PHILADELPHIA, PA., U. S. A.
IN CANADA: ST. CATHARINES, ONT.

Announcing TRICOLENE

Super-Lubricant for Dies—Tools—Bearings

Tricolene added to your present lubricant preserves an unbroken protective film, that often is the answer to difficult jobs in drawing and stamping, metal-cutting and die-casting.

If you are having trouble with cracking or wrinkling in stamping or deep-drawing, with excessive tool wear or rough cutting in machining or threading, with "welding" or sticking in die casting—it will pay you to try Tricolene. Also it is practically a cure-all for hot bearings—especially roll or journal bearings.

Developed by machinery specialists, after exhaustive tests, Tricolene not only ends lubrication problems, but frequently reduces lubrication costs.

WRITE FOR FREE SAMPLE

Send a post card for a free one-ounce sample of Tricolene—enough for any test. Address nearest Danly Branch.

LONG ISLAND CITY, N. Y.
36-12 34th Street
DETROIT, MICHIGAN
1549 Temple Avenue
CLEVELAND, OHIO
1745 Rockwell Avenue

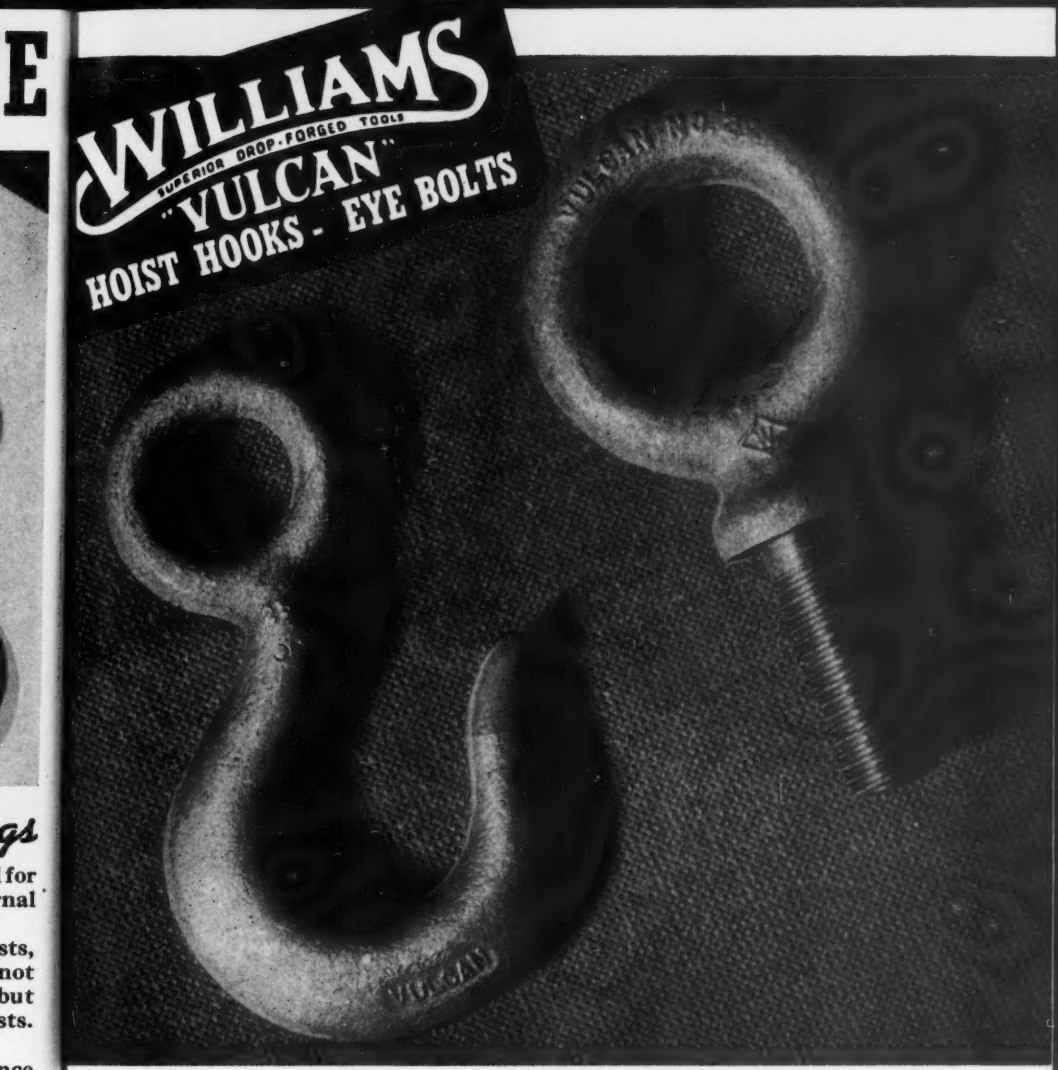
DANLY MACHINE SPECIALTIES, INC.
2130 South 52nd Avenue, Chicago, Illinois

DAYTON, OHIO
990 E. Monument Avenue
PHILADELPHIA, PA.
3913 N. Broad Street
ROCHESTER, N. Y.
16 Commercial Street

MILWAUKEE, WIS., 513 East Buffalo Street

DUCOMMUN METALS AND SUPPLY CO. • LOS ANGELES • SAN FRANCISCO

DANLY DIE SETS and DIE MAKERS' SUPPLIES



PROOF-TESTED TO FIFTY PERCENT BEYOND RATED SAFE LOAD

All Williams' "VULCAN" Hoist Hooks and Eye Bolts are drop-forged from carefully selected steel, and heat-treated after forging. Every individual Hook and Eye Bolt is *proof-tested to 50% beyond its rated* "safe working load." For safety sake, insist on getting this extra assurance of strength and dependability.

"VULCAN" Hoist Hooks are furnished in Shank and Eye patterns—½ to 25 tons capacity. Identify them by the orange tip. "Vulcan" Eye Bolts are furnished in Plain and Shoulder patterns, shanks blank or threaded, in a complete range of sizes—1/5 to 16 tons capacity. *See your jobber. Ask for free literature.*

H. WILLIAMS & CO. HEADQUARTERS FOR 225 LAFAYETTE ST., NEW YORK

Hendey 16" 18-speed geared head tool room lathe, equipped with relieving attachment and sub-headstock. The sub-headstock gives a range of slow driving speeds, indispensable in chasing screw threads of very coarse pitches, turning and relieving hobs with long leads, relieving wide face forming cutters, turning work on dead centers. The relieving attachment will also back off right and left hand taps, counterbores, threading dies, etc. Headstock fitted with anti-friction bearings throughout and automatically lubricated. Spindle bearings both front and rear are super-precision with the main bearings pre-loaded.

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THE HENDEY MACHINE CO.

TORRINGTON • CONN. •

NEW ACME

NO. 3-S UNIVERSAL TURRET LATHE

Bar Capacity - 4½"
Swing Over Bed - 26½"
Swing Over Carriage Wings - 24½"
Longitudinal Travel of Hexagon Turret - 57"

FEATURES . . .

Fixed center or cross sliding hexagon turret.

Pyramid construction of headstock.

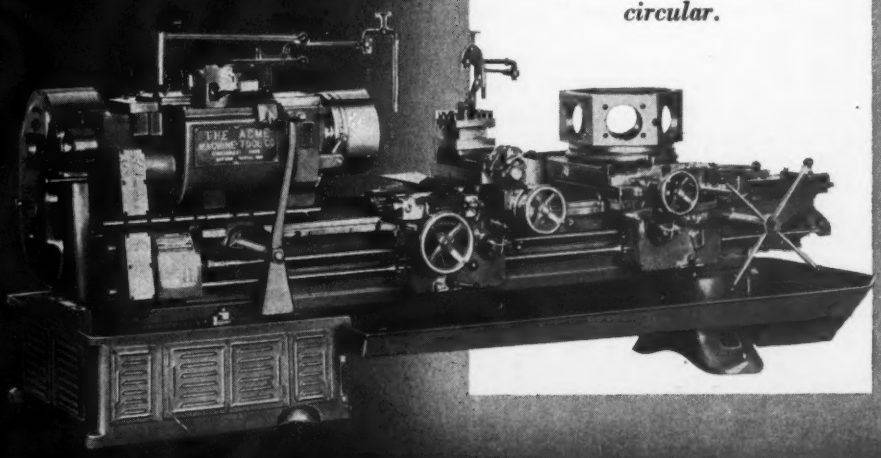
Hardened and ground one-piece steel vees.

Bridge type universal side carriage.

One shot lubrication for both carriages.

Triple roller bearing spindle.

Write for illustrated circular.



THE ACME MACHINE TOOL COMPANY
CINCINNATI OHIO

precision with the main bearings pre-loaded.

4 REASONS WHY THE P&H ZIP-LIFT COSTS YOU LESS!

HERE'S WHAT YOU GET FOR SO LITTLE!

1. *All-steel construction*—means more years of low-cost, repair-free hoist service.
2. *Double brakes*—for double safety, the kind you want on your production line.
3. *Triple-safe limit switch* that protects you against accidents.
4. *All the known safety features* that are embodied in P&H overhead cranes.

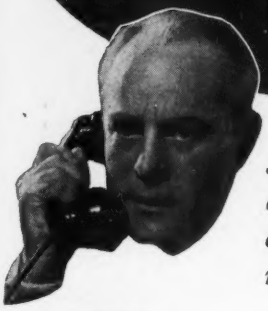
The Zip-Lift makes a one finger job of handling loads from 250 to 1000 lbs. Easy to operate, it is an ideal hoist for machine shops and other industrial uses. Write today for Bulletin H-2. Address the Harnischfeger Corporation, 4535 West National Avenue, Milwaukee, Wis.

Here's quality hoist construction at its best — the Zip-Lift kind! It means Zip-Lifts actually cost less to use than "cheaper hoists." Investigate today!

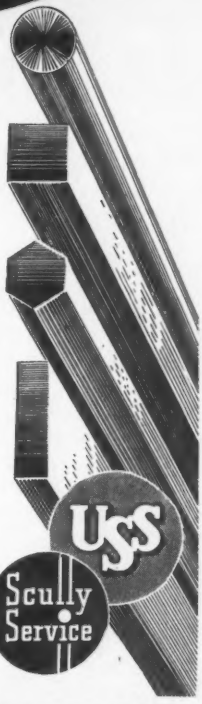
The ZIP-LIFT stops waste with "spot handling"

HARNISCHFEGER
CORPORATION
HOISTS • WELDING ELECTRODES • MOTORS P&H EXCAVATORS • ELECTRIC CRANES • ARC WELDERS

call Scully for
COLD FINISHED STEEL BARS



. . . a large and splendidly assorted stock of carbon and alloy grades to meet every requirement.



WHEN you use the exact quality of bar best suited to your individual requirements you reduce production troubles and produce finer products. That's why Scully Service is so valuable to users of Cold Finished Steel Bars. Each of our eight warehouses has a complete line of bars in a wide range of sizes, shapes and specifications, available for immediate shipment.

Get better workmanship and better parts. Call Scully for your Cold Finished Steel Bars. We also carry a complete line of Hot Rolled Bars in standard qualities, forging qualities, and alloys.

"It means much to use the quality best suited to your needs"

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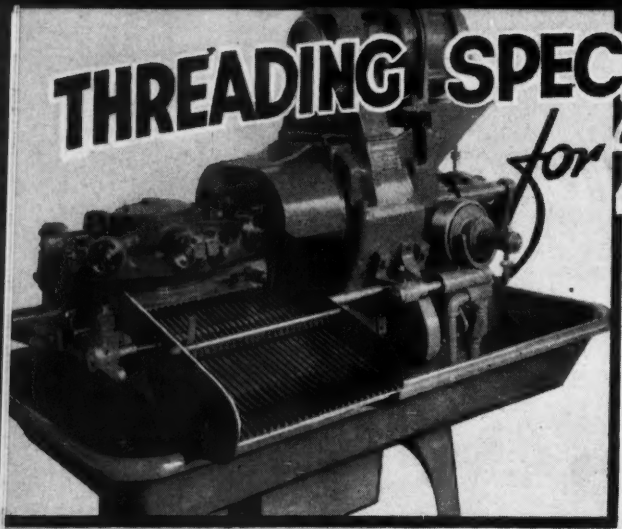
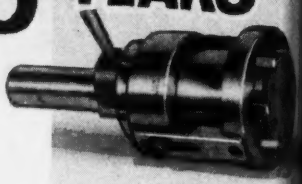
UNITED STATES STEEL

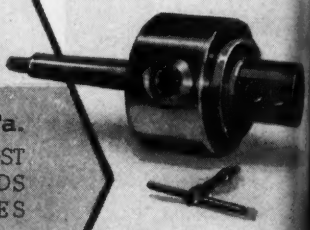
THREADING SPECIALISTS -- for 25 YEARS



R-S Semi-Automatic Threading Machines—Double Spindle type (illustrated) for spark plug and similar second operation threading, also made in single spindle type.



R-S Model B Collapsible T
Stationary Type (illustrat
also available in Revol
Type. External Trip Mi
meter-adjusted by knu
ring.



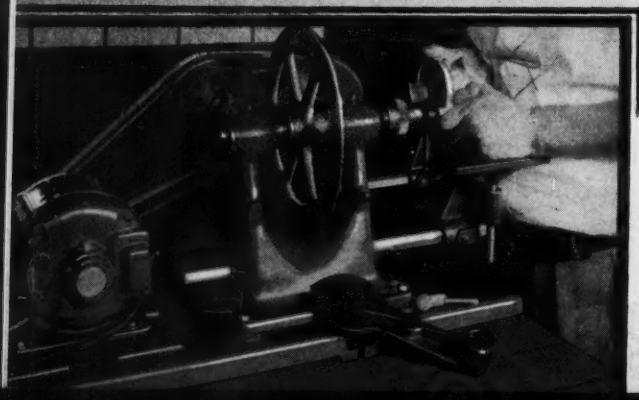
R-S Adjustable Boring H
available in 3 sizes.

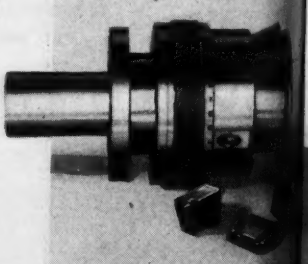
The **RICKERT-SHAFER** Co., Erie, Pa.

Specialists in ACCURATE THREADING *at* GUARANTEED LOW COST
DIE HEADS ✦ TAPS ✦ CHASERS ✦ BORING HEADS
THREADING, TAPPING AND CUT-OFF MACHINES

R-S $\frac{5}{16}$" Portable Bench type Horizontal Tapping Machine (illustrated). These popular Tapping Machines are made in many sizes for Horizontal or Vertical Tapping for either bench or column mounting.

Write for data, catalogs and prices.

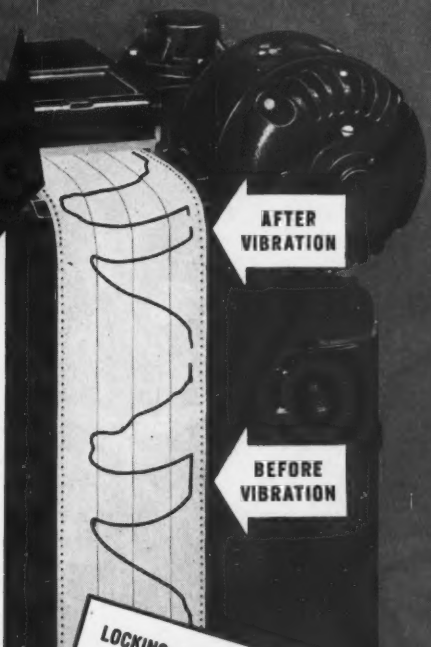




R-S Model C Die Hea
volving Type, Yoke Con
led (illustrated). Model
the stationary type.

CONSIDER THIS RECORDED EVIDENCE

of SHAKEPROOF Locking Power



ACTUALLY LOCKS TIGHTER UNDER VIBRATION!

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Hundreds of scientifically conducted tests on precision-built testing machines give factual evidence of the outstanding locking efficiency of Shakeproof Lock Washers. Of particular interest is the data secured from tests on the Maximeter, an electrically operated machine which graphically records the torque force values required to tighten and loosen nuts and screws. These tests conclusively prove that while Shakeproof Lock Washers hold tightly on initial contact, they actually lock tighter after exposure to vibration — your assurance that vital connections locked with Shakeproof will stay tight.

SHAKEPROOF LOCK WASHER CO.

Distributor of Shakeproof Products
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External-Internal Type

FREE!

A small kit containing samples of Shakeproof Products will be sent upon request.

LOCKING EFFICIENCY SCIENTIFICALLY PROVED!

Detailed explanation of these tests will be furnished to metal product manufacturers on request.

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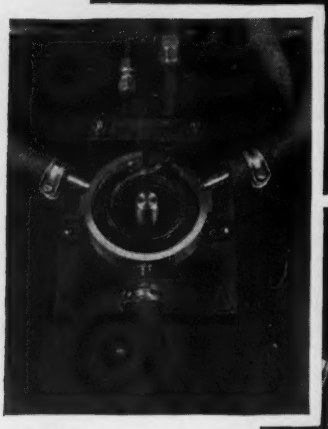
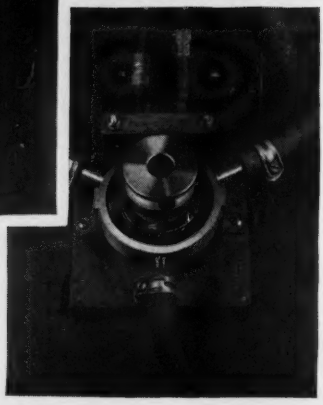
SEMS Fastening Units . . . Lock Washers
Locking and Plain Terminals

Thread-Cutting Screws . . . Locking Screws
Spring Washers . . . Special Stampings

JACOBS CHUCKS

ARE NOW TOCCO HARDENED





JACOBS constant modernizati results in consistent major provements for Jacobs Chucks. heat-treating, Jacobs has just stalled this modern Tocco Hard ing Machine which treats Fl Bearing Chuck Bodies so that o those parts subject to wear selectively surface-hardened, wi absolutely avoiding distortion maintaining the original close curacy of the Bodies—with po tive duplication of results. T extremely high standard of har ening is accomplished by high f quency electrical induction whi passes a 250,000 cycle curre through the coil shown in the sert, surface-heating only the ar to be hardened to 1450° F. with a few seconds. Previously set co trols determine length of heati dwell and automatic quench split-second accuracy. Once aga Jacobs Chucks lead ... m strength, finer accuracies, long life.

IF IT'S A *Jacobs* IT HOLDS!

THE JACOBS MANUFACTURING COMPANY, HARTFORD, CONN

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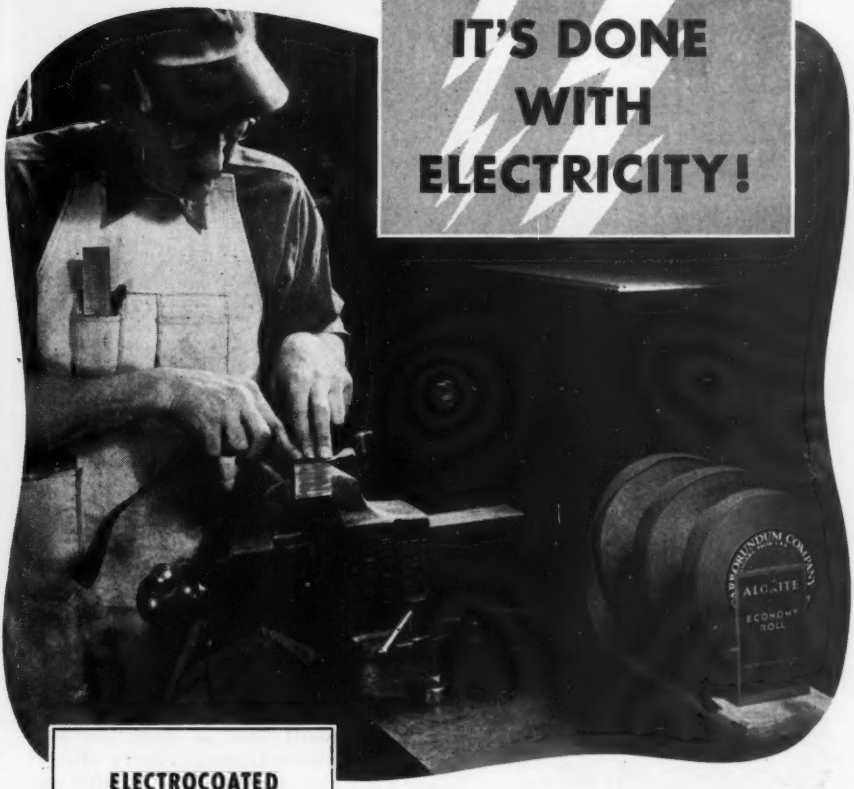
IT'S DONE WITH ELECTRICITY!



ELECTROCOATED ALOXITE BRAND ALUMINUM OXIDE ABRASIVE CLOTH

- *Cuts faster*
- *Lasts longer*
- *Stays sharp*
- *Gives more uniform finish*

CARBORUNDUM ABRASIVE PRODUCTS

Yes, the abrasive coating on Aloxite Brand Aluminum Oxide Abrasive Cloth is applied by the famed "Electrocoated" process. The abrasive grains are evenly spaced on the backing. And each grain stands on end firmly anchored in the glue bond... sharp points exposed for most efficient cutting action. No wonder Aloxite Brand Cloth has a better "bite" than ordinary cloths... does a faster, more uniform job on all metal finishing, lasts longer! Give it a trial in your own shop and see the difference. Available in 1", 1½" and 2" wide Economy Rolls, and in 9" x 11" sheets. Order from your jobber.

THE CARBORUNDUM COMPANY
REG. U. S. PAT. OFF.
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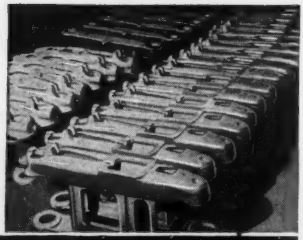
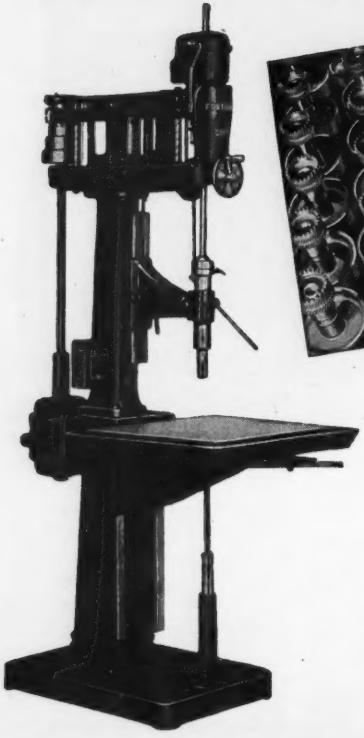
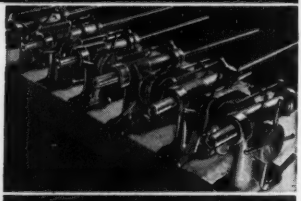
Sales Offices and Warehouses in New York, Chicago, Philadelphia, Detroit, Cleveland, Boston, Pittsburgh, Cincinnati, Grand Rapids
(Carborundum and Aloxite are registered trade-marks of The Carborundum Company)

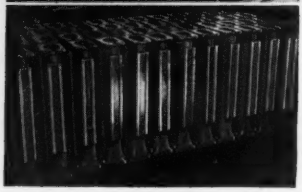
Advanced Design – Accurate Parts



MEAN ENDURING ACCURACY FOR GRUELLING WORK







Tool room and production work demands a sensitive drill that is accurate and remains accurate through years of use. Every Footburt part is thoughtfully designed, carefully made, and thoroughly inspected to produce a tool that will meet these demands under most severe conditions in your plant.

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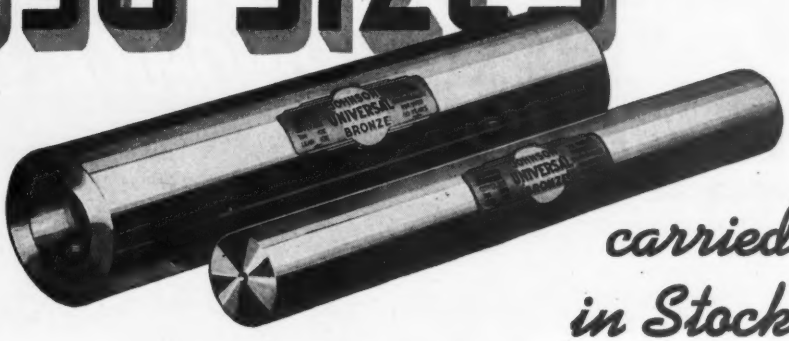
THE FOOTE-BURT COMPANY
CLEVELAND, OHIO
Detroit Office: 4-151 General Motors Building

FOOTBURT SIPP SENSITIVE DRILLS

350 SIZES



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JOHNSON UNIVERSAL BRONZE BARS

FREE

72 page catalogue listing and describing the most complete bronze bearing service in the world.

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● Save time and money . . . avoid delay by specifying Johnson UNIVERSAL Bronze. With over 350 sizes to choose from you can order exactly according to your needs. Conveniently located stocks permit shipment the same day your order is received.

Every bar is completely machined—I.D.—O.D. and Ends. This saves you 25% in purchased weight over rough bronze. Then too, you know in advance that every bar is usable—from end to end. Every bar is cast in S.A.E. 64—Copper 80%—Tin 10%—Lead 10%.

For real service, depend entirely on Johnson UNIVERSAL Bronze.

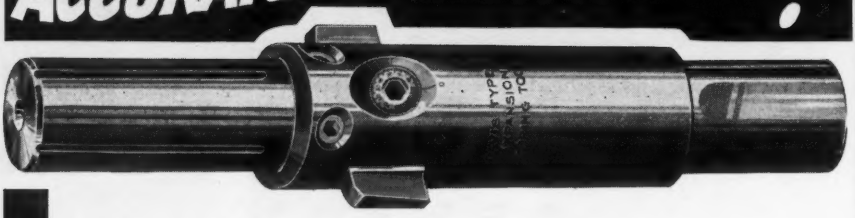
SOLD THROUGH INDUSTRIAL SUPPLY DISTRIBUTORS

JOHNSON BRONZE

Sleeve BEARING HEADQUARTERS

590 S. MILL STREET • NEW CASTLE, PA.

For FASTER PRODUCTION- ACCURATELY, ECONOMICALLY!



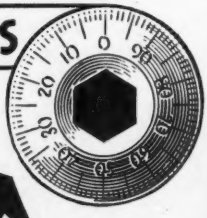
THE famous Davis Micrometer Type Boring Bar, pictured above, will introduce new standards of efficiency and economy into your plant.

Operation at maximum efficiency is assured by quick, accurate Micrometer adjustment of cutters for size.

Made in multiples for line boring, this accurate tool is designed for successful use on any rough, semi-finish or finish boring operations.

Send us prints of your work for a specific, money-saving recommendation. No obligation. Write us today.

DAVIS BORING TOOLS



DAVIS BORING TOOL DIVISION
Larkin Packer Co., Inc., St. Louis, U.S.A.

"You get the Order because—"

"We need these gages immediately and *"Greenfield"* is the only company that can deliver a substantial part of the order from stock." (The actual story behind a recent $3,000 gage order taken by a *"Greenfield"* salesman.)

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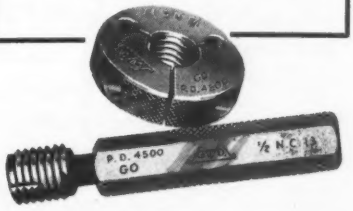
No manufacturer can afford to wait around for gages in today's market—too costly! *"Greenfield"* realizes this—and has built up its stocks and facilities to give *speedy service* as well as super-accuracy.

"REX FINISH" GAGES FOR LONGER LIFE

"Greenfield's "Rex" finish is a special surface treatment which increases the life of a gage — guaranteed not to chip or crack in use and makes for much longer life.



GREENFIELD TAP & DIE CORPORATION, GREENFIELD, MASS.

"GREENFIELD" SOLD BY DISTRIBUTORS EVERYWHERE
TAPS
DIES · DRILLS
SCREW PLATES
PIPE TOOLS
REAMERS
GAGES

GREENFIELD

Detroit Plant: 2102 West Fort St. Warehouses in New York, Chicago, Los Angeles & San Francisco. In Canada: Greenfield Tap & Die Corp. of Canada, Ltd., Galt, Ont.

YOU CAN *EXPECT MORE* FROM A *STANLEY ELECTRIC TOOL*

. . . No. 566 STANLEY PORTABLE GRINDER

You'll find this Stanley Grinder a fast, powerful tool for snagging castings, smoothing welded surfaces, removing rust, scale and paint, and for grinding, wire brush work, buffing and polishing metal surfaces wherever work is too large to be taken to a bench grinder. Motor mounted on seal type ball bearings which retain lubricant — keep out dust and dirt. Nickel steel gears specially heat-treated for long, carefree service. Coarse grain 6″ wheel of first-quality abrasive. Eyebolt at point of balance permits spring suspension.

ASK YOUR STANLEY DISTRIBUTOR FOR A DEMONSTRATION, OR WRITE TODAY FOR DESCRIPTIVE LITERATURE

STANLEY ELECTRIC TOOL DIVISION, THE STANLEY WORKS, 137 ELM ST., NEW BRITAIN, CONN.

STANLEY **STANLEY ELECTRIC TOOLS** STANLEY

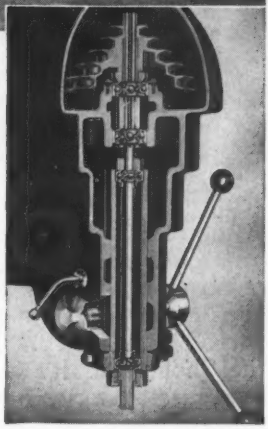
"COST LESS PER YEAR"

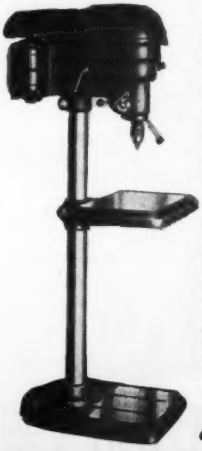
MEMO

Get more Drilling & Tapping done for less money

with BOICE-CRANE HELMET HEADS

Boice-Crane Helmet Heads are the SUPER light duty Drill Presses with the famous totally enclosed drive. The most up-to-date and largest plants use them. But don't take from that that they're expensive for they're not.





Every comparison with other light duty drill presses shows Helmet Heads are built *stronger* for longer, harder service. That's true of the head, spindle, quill, bearings and every other part. They are your best bet for light drilling, reaming and tapping.

COMPLETE RANGE OF MODELS

Bench and Floor models. Two and four spindle manufacturing type units for consecutive operations. Other models have lightning-fast reverse Tapping Heads with important new features to reduce setup time and tap breakage. For utmost economy on lightest jobs use our No. 1600 series Drill Presses. Made in same range of types as Helmet Heads.

BUILT TO LAST LONGER

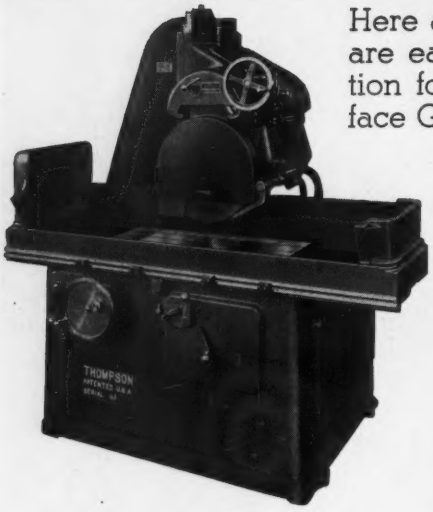
New engineering principles exclusive in Helmet Heads like the 6 tooth *involute* type spline, *line-bored* head and longer quill seats, *add years of extra service.*

DON'T DELAY! REAP THE HARVEST OF SAVINGS POSSIBLE WITH BOICE-CRANE HELMET HEADS

Write Today for fact-jammed catalog, prices, and name of nearest BOICE-CRANE dealer.

BOICE-CRANE COMPANY 1729 NORWOOD AVE. TOLEDO, OHIO

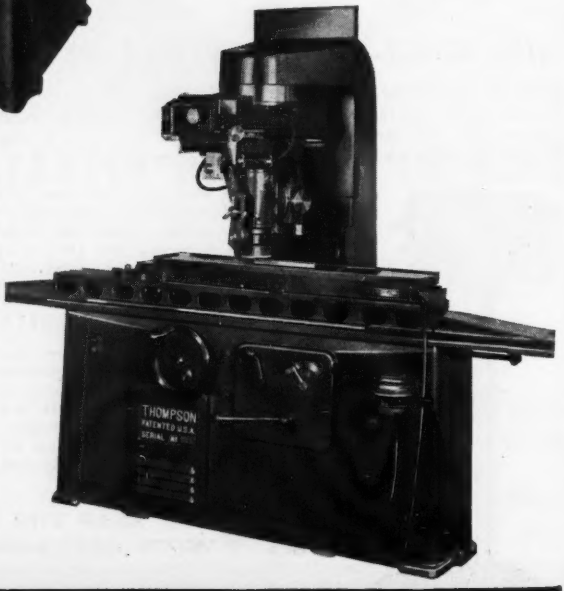
THOMPSON GRINDERS



Here are some of the features that are earning a cost-cutting reputation for Thompson-Hydraulic Surface Grinders:

Balanced "finger-tip" controls.
Speedy, cool cutting with hydraulic and automatic equipment.
Automatic wheel truer.
Dynamic balance.
Easily maintained accuracy.
Greatest possible economy.

A thoroughly field-tested broach grinding machine capable of cutting tool grinding costs to rock bottom . . . that's the Thompson. It's fast ...accurate...automatic.



WRITE FOR CATALOG GIVING COMPLETE DETAILS.

THE THOMPSON GRINDER COMPANY

SPRINGFIELD • OHIO

"DYNO-MITE" DOUBLES PRODUCTION

MINIMIZES FATIGUE

They gave the little lady a rest . . . *and found that she worked twice as fast.* In the actual case pictured above, the slower hand-powered screw driver was retired from this assembly job, and the powerful, delicately-adjustable DYNO-MITE was put to work. Its ADJUSTOMATIC CLUTCH—exclusive Millers Falls principle—affords perfect torque control over a wide range; its high quality construction keeps its performance dependable. Aren't there a few girls in *your* plant who'd be glad to *double* their production with DYNO-MITE? Ask your supplier to arrange a free trial, and write today for further information.

Dyno-Mite Screw Driver.

10" long, weight 3 pounds.

Sure one-hand control.

MILLERS FALLS TOOLS

MILLERS FALLS COMPANY GREENFIELD, . . MASS. . .

Announcing the Great New

Thor

Drill Champion

HALF-INCH ELECTRIC DRILL

$35.00

New Price!
New Power!
New Performance!

Here is a new half-inch capacity electric drill for general light-duty service that brings you Performance *plus* Economy. The Thor Drill Champion is amazingly low in price, yet you get *all* the features that have made the name Thor the symbol of quality in portable power tools for nearly fifty years.

This new half-inch drill is small and compact. It is light and perfectly balanced. It's rugged and sturdy. The motor . . . the most efficient ever put in a tool in this price class . . . has generous overload capacity.

Look at the lines of this new Thor ½" Drill Champion. One glance tells you that here is a tool that's easy to handle. Look at the compact sturdiness! You *know* that this torpedo-like housing is built to take it! And inside! If you like mechanical excellence you'll get a kick out of construction that rivals a fine watch for precision and the Boulder Dam for ruggedness!

Try the Thor Drill Champion for general maintenance, installation or light production work in wood or metal and you'll see why there isn't a low-cost drill in the running with it today. Send the coupon for a Free Trial now!

SPECIFICATIONS	
CAPACITY	In steel, ½"
FREE SPEED	450 r.p.m.
WEIGHT	9¼ lbs.
LENGTH OVERALL	15 in.

Universal motor, 110 or 220 volts. Jacobs Chuck and Key, Trigger Switch with locking pin, handle, Spade handle, Dead handle. 3-conductor cable and plug.

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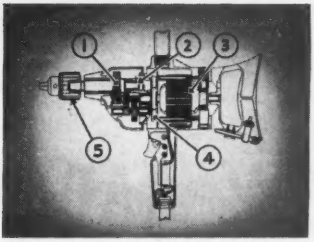

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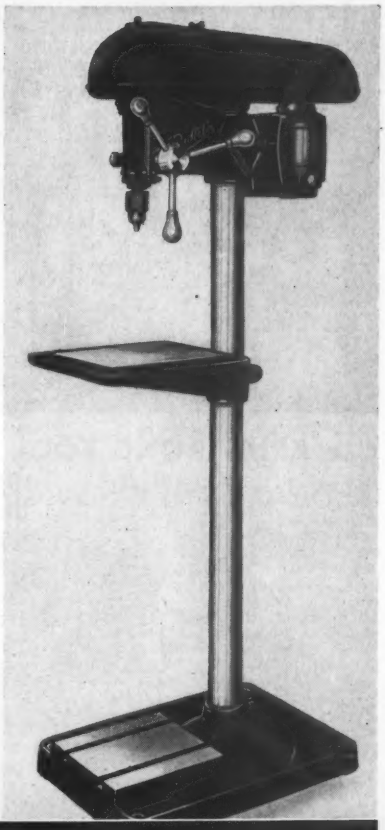

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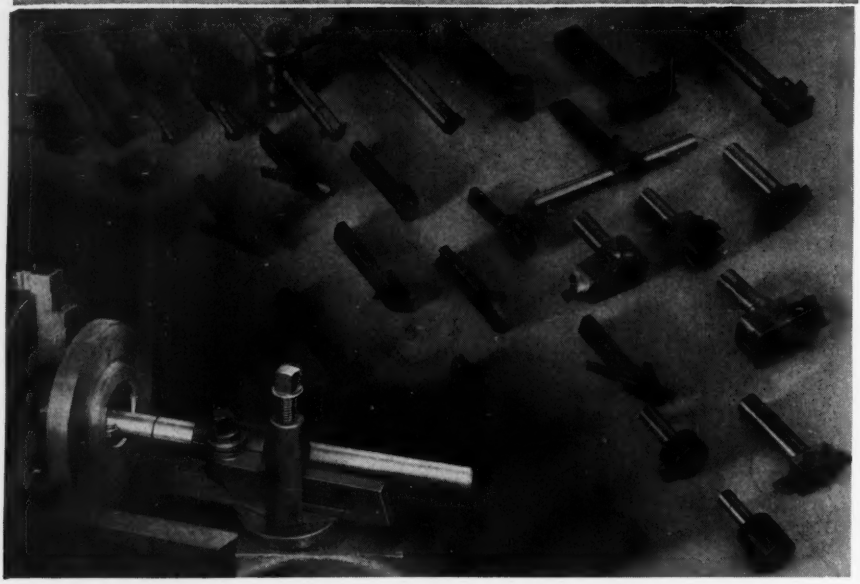

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NOVEMBER, 1939 VOL. 12, NO. 6

"Curve - Shaving"

A discussion of tools and methods employed in modern gear production

By CHAS. R. STAUB
Engineer, Michigan Tool Company

QUIETER gears, particularly when hardened, elimination of tooth breakage, particularly in acute helix angle gears, and materially reduced lapping time together with increased life of laps are said to result from a new gear-finishing process called "curve-shaving."

In effect, the process produces teeth which are slightly curved, the ends being low and the center slightly thicker. This contour prevents concentration of loads at the ends of the teeth due to possible heat-treating warpage, assembly misalignment, or deflection under load—frequent causes of tooth breakage, particularly with acute angle helical gear teeth.

Noise in hardened gears is also often traceable to the fact that warpage may result in one tooth being high at one end while the next tooth may be too high at the other end, resulting in an out-of-time ratio velocity.

Experience so far has shown that lapping time on curve-shaved gears averages about half that usually required, while the life of the laps is increased in even greater proportion

Fig. 1 — The two finishing cutters of the Duplex finisher may be used for curve-shaving by setting them at a slightly increased or decreased angle in relation to the normal crossed-axis shaving angle.

by eliminating gouging of the laps by projecting sharp ends.

Use Standard Finishing Machines

The process does not necessarily require new machine tool equipment. For instance, it may be adapted to either a Michigan rack type or Duplex rotary gear finisher. The feeding movement on the latter machine is at right angles to the axis of the gear being shaved. Two rotary cutters as shown in Fig. 1 are used, set at a

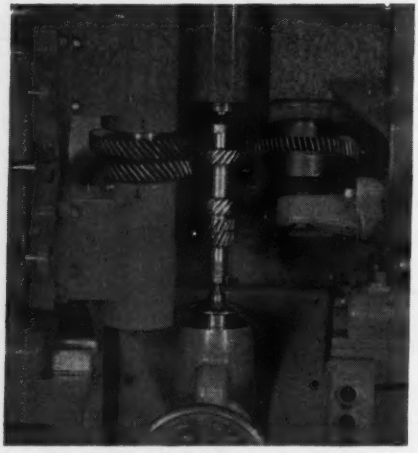


Fig. 2—Michigan Triplex shave. The cutter at the right finishes the gear, the two at the left curve-shave the gear at the same time.

slightly greater and smaller angles respectively than are used for normal crossed-axis shaving angle.

A variation of the process on the same type of machine employs a three-cutter method. Fig. 2 shows this triplex curve-shaving set-up. Of the three cutters, the one at the right side is a rotary finishing cutter of the conventional type, set for crossed axis shaving. The two cutters at the left are mounted on separate heads (see Fig. 5) which may be set at opposite angles to curve-shave the gears while they are being finished. The theoretical angle of these two cutters is the same as the helix angle of the gear being crowned, but the teeth are tapered.

Assuming a 30-deg. gear helix an-

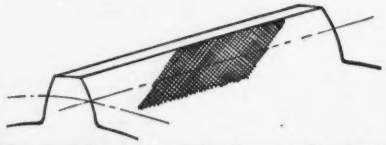


Fig. 3—Bias type of bearing produced with single rotary cutter (not satisfactory).

gle, one side of the cutter is ground at, say, 33 deg. 5 min. helix angle while the other side would be ground 26 deg. 55 min. The cutter head is then set at 30 deg., thereby producing a tapered tooth.

The cutters in this set-up function only approximately ¼ in. or so in from the edge of the tooth on an 8-pitch gear, removing only a very small amount of stock or just enough to relieve the bearings on the ends of the teeth.

This method has been the only satisfactory one found for correctly crowning gears with rotary cutters. Experiments have been carried on in which a cam is used to actuate the shaving cutter in a conventional rotary gear finisher, producing a cutter

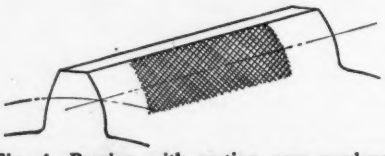


Fig. 4—Bearing with mating gear produced with curve-shaving.

movement parallel to the axis of gear.

In this method the cutter will be cutting a smaller pitch diameter than standard at the beginning of the cut, and then automatically spread the centers to maintain cor-

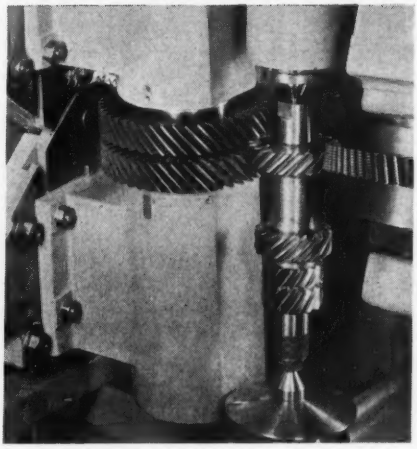


Fig. 5—Close up of Triplex set-up showing the two curve shave cutters at left mounted on individually adjustable leads.

rect pitch diameter of the gear until it passes through to the other side. Center distance then closes in once more to produce a crowning effect.

The same is true when the work is swung on an arc in a rotary gear finisher. The difficulty with both these methods, however, is that the crowning effect is true on the pitch line of the gear only. Checking at the working depth and at the tip of the tooth invariably shows more drop-off on one side than on the other. Fig. 3 shows the type of "bias" thus produced.

While this is true of the single rotary cutter type of machine, it does not apply to rack-type shaving equipment. For the latter type of machine, the process involves merely the use of a new type of rack.

As shown in Figs. 6 and 11, the rack is divided into two sections. In one section the blades are set to give a greater angle than the true helix angle, while in the other section they are set at less than the true helix angle, thus producing the same effect as is obtained with two separate cutters.

The rack is so designed that the same rack box which is already in use may be adapted. Two tapered dummy blades are used in the center of the rack, and one dummy blade is used to compensate at each end. The same blades may not be used, however, since it becomes necessary to change the pressure angle of the blades for each section to ensure maintenance of the same base diameter in the plane of rotation of the gear as its center and at both ends.

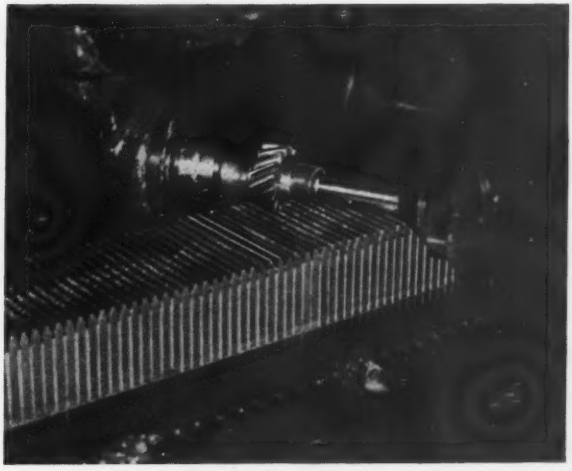


Fig. 6 — Curve-shave rack, showing dummy tapered blades in center, in use at a leading transmission plant.

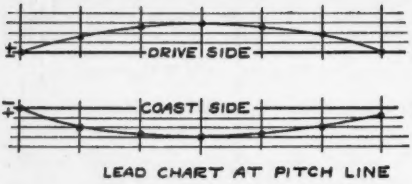


Fig. 7—Typical lead chart of "curve-shaved" gear taken along the pitch line. Each line on the chart represents 0.0001 (center of gear is 0.0003 in. higher than ends).

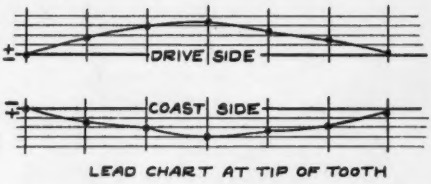


Fig. 8—Chart of same gear taken at tip of tooth.

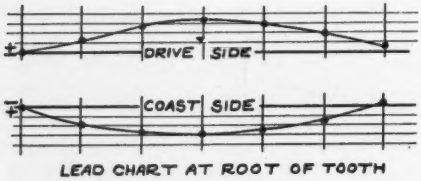


Fig. 9—Chart of same gear at last contact point of mating gear (near the root of the tooth).

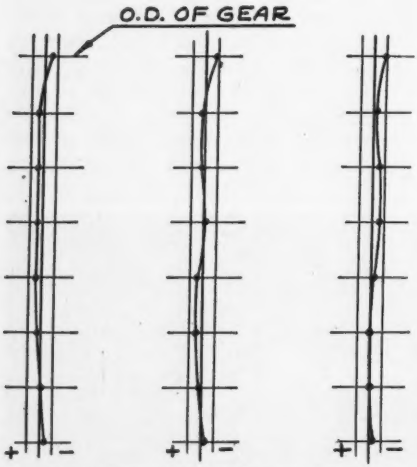


Fig. 10—Involute charts of same gear, taken at center, right and left ends.

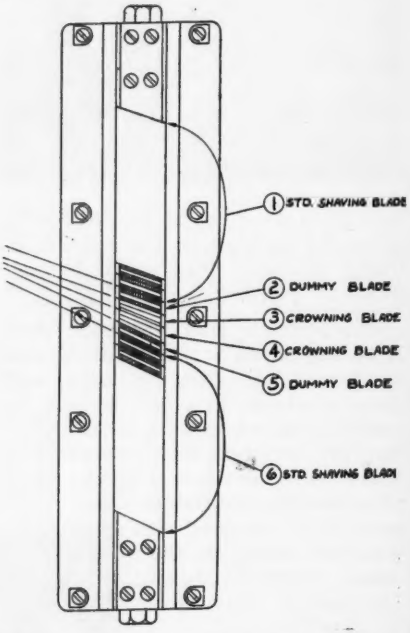
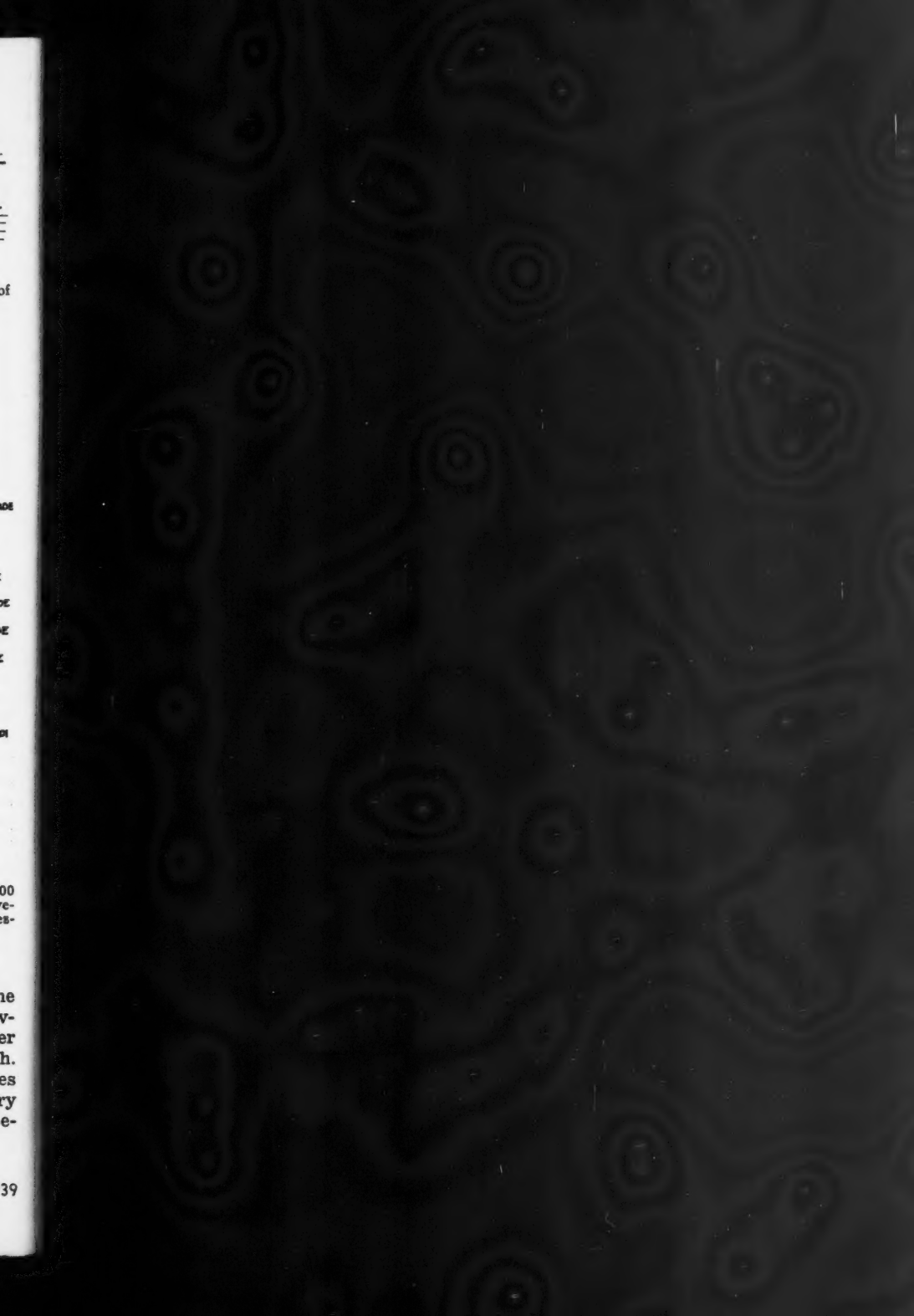


Fig. 11—Diagram of rack for Michigan 900 or 854 Gear Finisher, adapted for curve-shaving. Blades have slightly different pressure angles in each section.

Typical lead charts of curve-shaved helical gears are shown in Figs. 7, 8 and 9. Fig. 10 shows the involute charts for the same gear, while Fig. 4 shows the type of bearing obtained by curve-shaving with the rack.

In curve shaving with a rack, the gear must make two complete revolutions on the rack in order to cover all four corners of the gear teeth. The rack method, however, provides an extremely simple and satisfactory method of "Curve-Shaving," especially on large production.



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Planning an Industrial Lighting Job

Using Light to the Best Advantage—Elimination of Shadows by Diffusion—Uses of Supplementary Lighting

By W. H. KAHLER

Lighting Division, Westinghouse Electric & Mfg. Co.

LIGHT is a "material." Not the kind of material that we can pick from the warehouse or handle by crane, but rather an intangible material. It is an architectural medium which can be prescribed in a specification in the same way that concrete and steel work is specified. There is an appropriate structural design for each type of industrial building and likewise, there is a correct method of lighting each type of visual task.

Visibility is merely the effect of light in creating contrast between various areas. This contrast may be between light and dark surfaces, different colors, or shadows. Real visibility is usually a combination of these factors. Since most objects are opaque, we depend upon reflection of light to make these contrasts. At times contrast is formed by transmission of light through translucent materials.

In industrial lighting we are primarily interested in light for seeing. Not just enough light to make objects barely perceivable, but light for comfortable, healthy seeing. We should provide adequate visibility plus the quality of lighting which eliminates eye strain and eye fatigue. The air conditioning and heating system is designed for efficient and comfort-

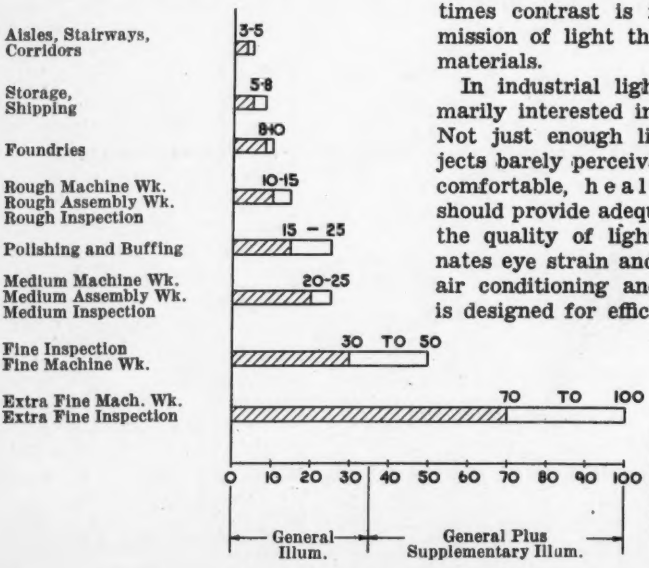

Fig. 1—Recommended footcandles for various visual tasks. Note: These values indicate order of magnitude rather than exact levels.

Fig. 2—Winton Engine Company, Cleveland, Ohio, illuminated with 500-watt Westinghouse Aluminum High Bay Reflectors. Note the uniformity of illumination and the soft shadows.

able functioning of the body, and lighting is equally important in providing well balanced, healthy working environment.

Adequate illumination is a common term, but it is meaningless in a specification, unless its component parts are clearly understood and described.

The quantity of light is one of the most important factors leading to good visibility. It should be remembered that the required amount of illumination increases as the severity of the visual task increases. A seeing task becomes more severe as contrast is reduced or as detail of work becomes more minute. For instance, in a textile mill the operators of a "spooler" must locate the loose ends of yarn breaks and repair them. This is a severe visual task because contrast is poor and vision is continuous. A high level of illumination should be provided. An opposite of this case is a warehouse where rough materials are handled and no detail of vision is required. Considerably less light will be sufficient for this type of location.

The speed of vision and apparent size of detail are both dependent upon the amount of light and can be increased by increasing the illumination.

The eye is extremely flexible and can adapt itself over a wide range of brightness. However, seeing is accomplished most efficiently when the correct amount of light is provided. It is possible to actually see with values considerably less than those which are recommended, but eye fatigue and strain will result which may cause other physical deficiencies. If we are improperly fitted with new footwear, our feet soon warn us of the condition, but our eyes are poor indicators of inadequate visibility and cannot readily inform us of a seeing hazard until headaches or physical fatigue occur after the eyes have been injured. Therefore, it is the respon-

Fig. 3—The Acme Steel Company, Chicago, Ill., is illuminated by Westinghouse High Bay Reflectors and Westinghouse Glassteel Diffusers (low bay). Both types of equipment use 400 watt mercury lamps and an average illumination of 30 footcandles is obtained.

sibility of the architect and engineer to specify adequate lighting for comfortable seeing.

In Fig. 1 a diagram is presented which indicates the approximate recommended amount of light in footcandles for various seeing tasks. The desired minimum footcandle values should be prescribed in the lighting specification and should be checked with a dependable "light meter" after the installation is completed.

It is not sufficient to have enough light just on the immediate area of the work, but general illumination should be uniformly distributed over the entire working area. "Spotty" lighting causes deep shadows and dark regions which may shroud mechanical hazards or unclean corners. The location of equipment including mounting height spacing and photometric characteristics must be considered in planning level illumination.

In a recent lighting installation at the Winton Engine Company, Cleveland, Ohio, shown in Fig. 2, a high value of uniform illumination was obtained with aluminum high bay reflectors mounted on 18 x 20-foot spacing 25 feet above the floor. The 25-foot mounting height was necessary to permit ample crane clearance. Lamps of 500 watt intensity were used and an average of 14 footcandles were obtained initially. This value will not be reduced much if reflectors are maintained, because they are treated by a process which prevents deterioration of the reflecting surface.

Diffusion of light is another factor which should be considered, especially where the seeing task is continuous and severe. Machine shops, assembly departments, inspection areas, and so on, are common applications requiring diffusion. This quality is obtained by the crossing of light rays

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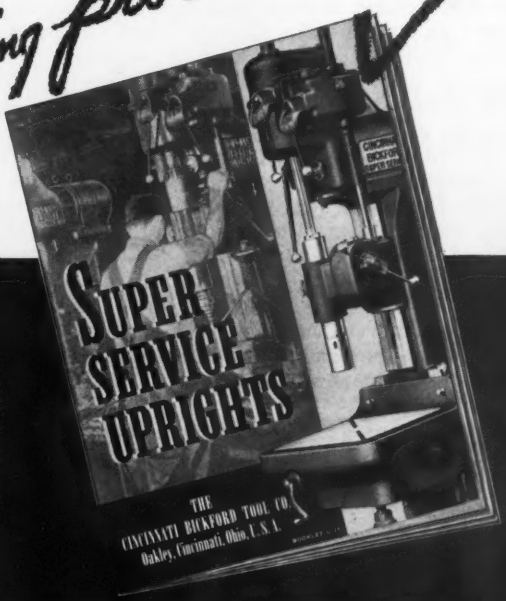

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from several luminaires or from a luminous area or areas. The industrial diffusing unit is most applicable for producing this quality. Good diffusion eliminates harsh, annoying shadows.

Glare is a phenomenon which every designer strives to avoid in his lighting layouts. Glare may be caused by a small area of high brightness in the field of vision against a dark background, such as a bare lamp. Large quantities of light emitted from luminous areas of low brightness may also cause glare. A white wall or large windows in the visual field are common examples. Glare may be direct from the light source or may be reflected from a specular surface. Either type will interfere with clear vision and cause eye discomfort and fatigue.

If intensified supplementary lighting is required on severe visual tasks, sufficient general illumination should be provided to eliminate a high contrast ratio between the actual working areas and the surroundings. It is recommended that the brightness ratio between work and surroundings should not exceed 10 to 1.

Ceilings, walls, and equipment painted with light colors will be very effective in reducing this contrast ratio and will aid in diffusing the light. Such interior treatment will also lead to higher installation efficiency because of the high reflectivity of light surfaces.

Since all artificial lighting represents the consumption of power, the dollar value of the installation depends upon the actual installation efficiency. That is, the number of footcandles per watt per square foot is a direct indication of how much light is obtained for metered power. Efficient lamps and luminaires correctly installed, plus light surroundings and regular maintenance, will net the highest dollar returns in lighting.

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Fig. 4—The Westinghouse Plant at Lima, Ohio, is illuminated throughout with combination mercury-incandescent luminaires. Sharp contrast is apparent even in this photograph.

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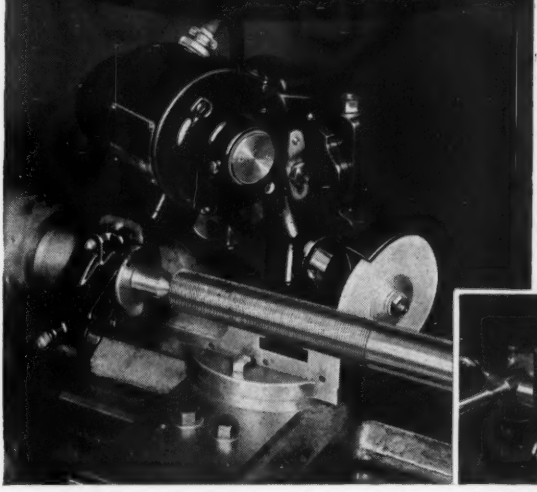

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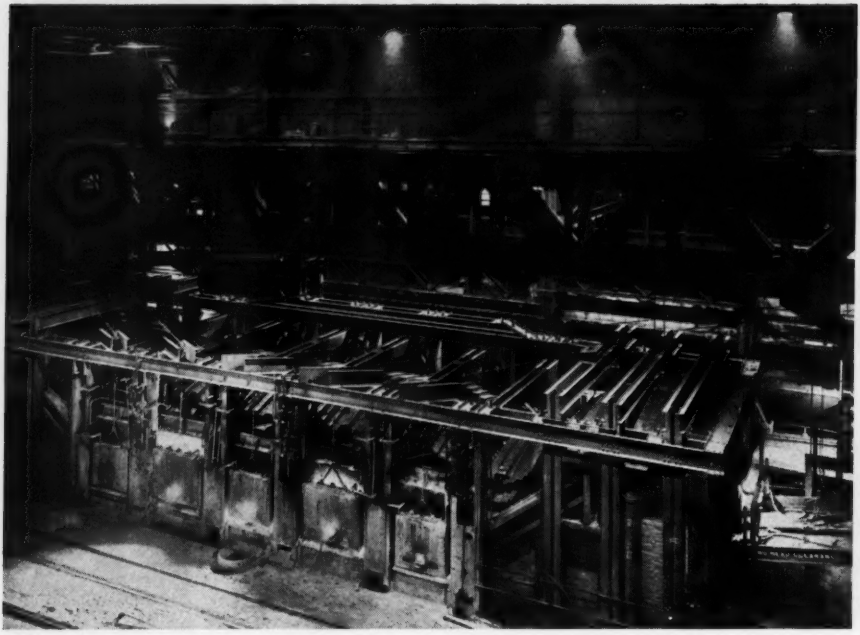

Fig. 5—The steel industry requires good lighting plus rugged equipment. This is a typical installation of Westinghouse Millites in the open hearth department of the Jones & Laughlin Steel Company, Pittsburgh, Pa.

lamp is popular for industrial lighting because its efficiency is about twice that of an incandescent lamp. Fig. 3 shows a typical installation of 400-watt mercury lamps in aluminum high bay reflectors installed in a modern factory. Thirty footcandles of uniform, efficient illumination is the result. The characteristic spectrum of this lamp also offers the advantages of longer life, higher visual acuity and sharper contrast for fine discrimination.

The light from a mercury source is a line spectrum consisting of about 98 per cent yellow and green, making objects of these colors stand out, whereas oranges and reds are subdued. By combining the incandescent lamp, which is strong in red, with the mercury, the noticeable color distortion is eliminated.

At the small-motor plant of the Westinghouse Electric & Manufacturing Company at Lima, Ohio, it was desired to obtain a high level of efficient illumination with good color quality. Visual acuity and discrimination of detail are very important. Good diffusion and a minimum of glare were also necessary.

In fulfilling these specifications, combination mercury-incandescent luminaires were used as shown in Fig. 4. The unit consists of an aluminum reflector, a large glass diffusing bowl and four sockets. Each reflector is equipped with one 400-watt mercury and three 200-watt Mazda lamps. The units are mounted on 18-foot spacing,

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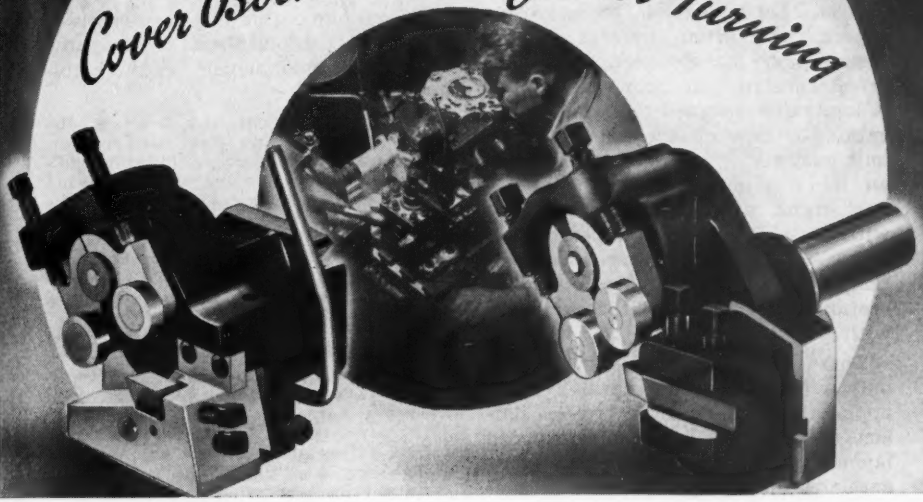


This new Warner & Swasey Single Cutter Turner is a high-production tool designed to handle the maximum feeds and speeds of modern turret lathes—ideal for high-speed steel or carbide cutters.

This tool is equipped with anti-friction bearing rollers—adjustable cutter block—relief for the cutter block—and flanged mounting to assure utmost rigidity.

The last word in a single cutter turner. You can get full details on this tool on page 72 of the new Warner & Swasey Tool Catalog.

• There are distinctly two separate fields of work for bar turners—one demands the utmost in accuracy at high speeds with heavy feeds, using high-speed steel or cemented carbide cutters—the other demand is for secondary work on new machines or for use on old turret lathes where maximum power and speed are not required. Here are the turners that meet both these demands.

This new Combination End Facer and Turner is a turning tool for secondary operations or for use on old machines where the maximum in power and speed is not required. Also used for end facing and chamfering.

Equipped with plain bearing rolls—solid cutter block—shank type mounting. Fits any type of turret lathe old or new. The details of the turner are shown on page 78 of the Warner & Swasey Tool Catalog.

If you do not have the new Warner & Swasey Tool Catalog, we suggest you write for it today—or better still, call in your local Warner & Swasey engineer, he will show you exactly what these tools will do to help you improve your turning operations and lower your costs.

WARNER & SWASEY
Turret Lathes
Cleveland

YOU CAN TURN IT FASTER, MORE ACCURATELY FOR LESS . . . WITH WARNER & SWASEY TOOLS

14 feet above the floor. An average of 33 footcandles is obtained.

The heavy industries not only specify efficient lighting of quality, but add the requirement of durability and ruggedness. Luminaires must withstand s e v e r e vibrations and shocks. Dust, smoke, or corrosive vapors are often present, which makes easy maintenance and vapor proof construction prime requisites. A luminaire designed to these specifications is now on the market. This unit consists of a steel housing with an inner aluminum reflector and a dust tight, vapor proof cover fitted with a clear, heat tempered lens which will endure severe shocks or temperature changes. Fig. 5 shows a section of a steel mill illuminated with this unit.

These installations are typical of only a few types of general lighting applications. There are many specialized industries which require tailored layouts. However, in practically every case the underlying principles of adequate lighting apply. All of the contributing factors must be considered and weighed according to their importance.

The result will be better lighting for better sight through careful architectural planning. This means for the factory management increased production, less spoilage and better workmanship.

Walker Single Stroke Surface Grinding Machine. In the Model D-B Single Stroke Surface Grinding Machine, illustrated and described in a 12-page circular issued by the O. S. Walker Co., Inc., Worcester, Mass., are incorporated features which provide for ample power, rigidity and accuracy under conditions requiring high production. and at the same time for quick adjustments in dealing with the wide range of work for which the machine is adapted. The construction of the Model D-B machine is clearly illustrated in a cross sectional drawing contained in the circular. A list of specifications for the Model D-B grinding machine is also given. Copy of Circular D-B-2 free upon request.

Statement of Policy

A communication has been received from The Lincoln Electric Company, Cleveland, Ohio, which reads as follows:

"The world is entering a crisis, the result of which no one can foresee. Other wars have brought inflation, followed by unemployment and depression after peace was achieved. America's experience in the World War illustrates this fact.

"Much of this post-war trouble would have been eliminated by a more foresighted price policy on the part of manufacturers and distributors. Price inflation by the seller when he had a dominant position resulted inevitably in reaction with deflation, depression and suffering. Many of those price increases were not warranted.

"Before such an inflationary cycle of prices is again started, we publicly pledge ourselves, as far as possible, to maintain present prices.

"Further, if the materials we buy are increased in price, or the cost of labor is increased, then we pledge ourselves to raise selling prices no more than the bare increase in cost of raw materials and labor going into our products.

"Further, we pledge ourselves to pass on to our customers the reduction in cost made possible by better manufacturing methods, wide distribution and technical advances in production."

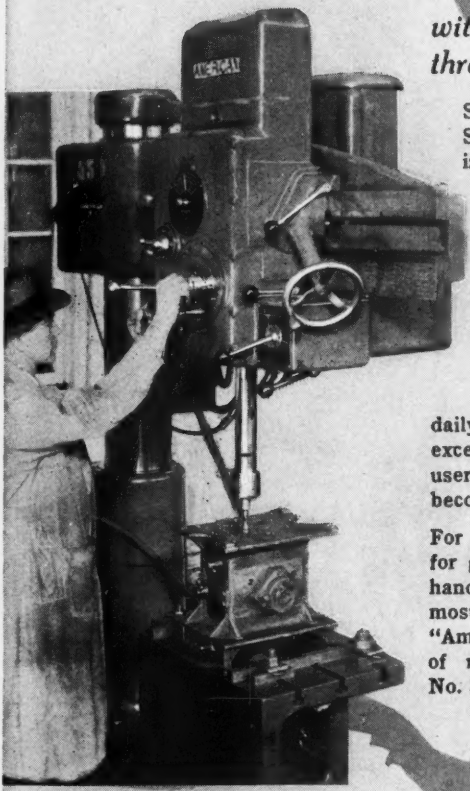
The Lincoln Electric Company.
(Signed) J. F. Lincoln, President.
Cleveland, Ohio, October 2, 1939.

It is sometimes a little hard to resist the inclination to pick up a little easy money by raising prices unwarrantably, but undoubtedly it is a paying policy to resist such temptations. As Mr. A. F. Davis, vice president of the above-mentioned company, says, all this is aside from any question of ethics. We don't believe it is right to charge high prices just because one can.

THE SENSATION OF THE *drilling field*

44,000 3/16" holes

without stripping a single thread or breaking a tap . . .



Several months ago one of the Southwest's leading manufacturers installed a 3-ft. "American" Hole Wizard. He now informs us that since its installation his Hole Wizard has drilled and tapped 44000 $\frac{3}{16}$" holes in Bohnalite Crank Cases without stripping a single thread or breaking a tap.

That's simply typical of Hole Wizard performance. Almost daily we receive enthusiastic reports of excellent results from Hole Wizard users. "American" Hole Wizards have become a sensation in the drilling field.

For greater production at lower cost; for greater range, versatility, ease of handling and accuracy, we invite your most searching investigation of the "American" Hole Wizard—the newest of new radials—Send for Bulletin No. 309.

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The Design of Grooves and Fillets As They Affect the Strength of Parts Under Reversed Loads

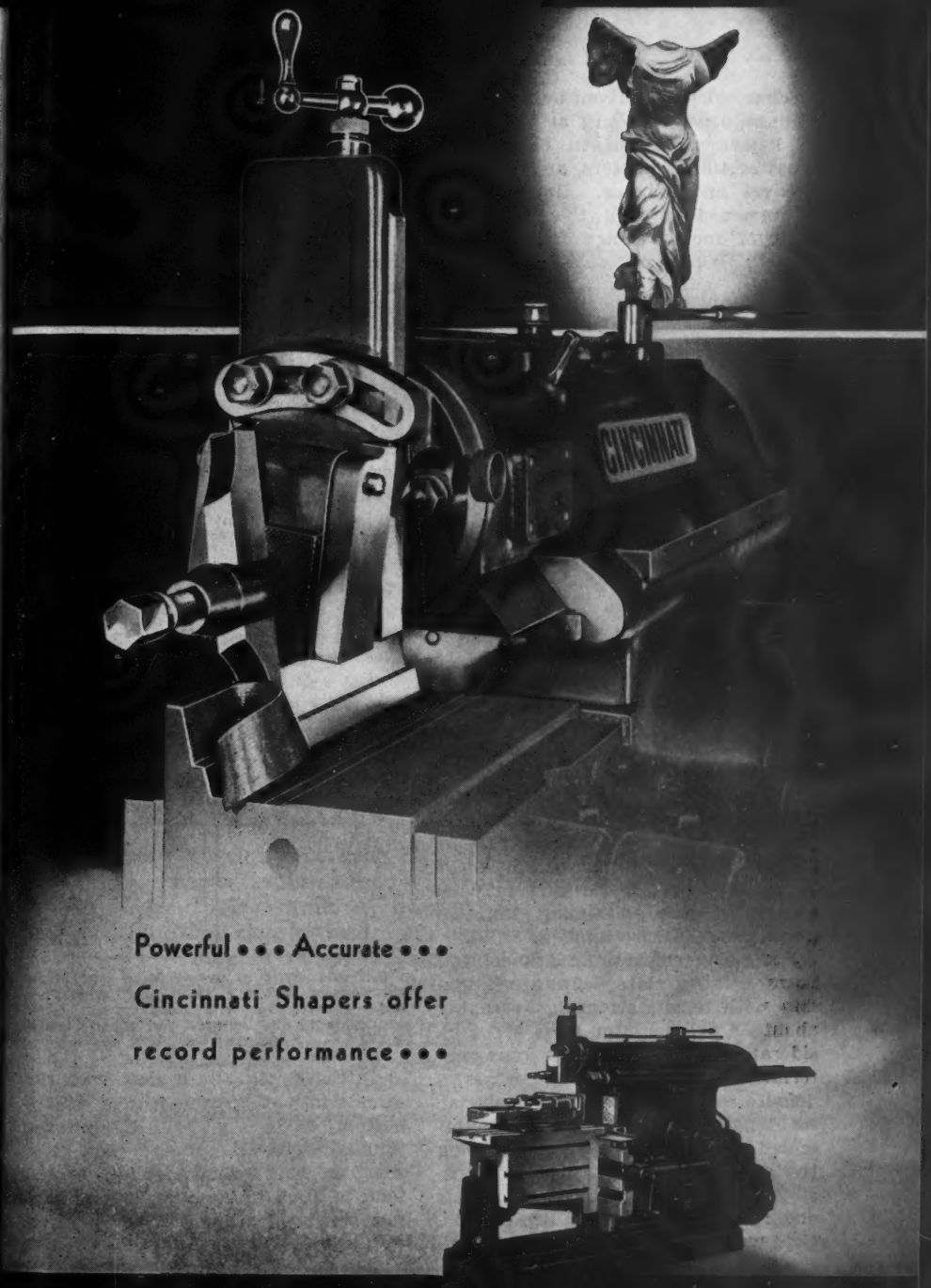
By L. KASPER

WHEN a machine part is subjected to reversed loads and failure occurs, there may be disagreement as to the cause of the failure even though logical arguments are advanced from different angles. Granting that the part was designed to carry the load under normal conditions, and that no abnormal conditions existed, a theory which was readily accepted not so many years ago and which even at the present time is frequently advanced, is the theory of crystallization. From continued flexure or torsion the metal was supposed to have changed from a fibrous to a crystalline structure of greatly reduced strength.

The crystallization theory is now practically in the discard; other theories have been advanced such as that of Edwards, who believes that the crystals vary in physical properties according to the orientation, and that of Gough who maintains that "fatigue" is the result of the slip or sliding of one plane of molecules over another. One point now seems to meet with general agreement, and that is that fatigue failure is caused by a concentration of stresses at one point. Failure does not necessarily occur suddenly, but may be spread over a long period of time, starting with a minute crack at the end of which stress concentration is very high. Continued flexure of the part causes the crack to increase in depth with increased stress concentration at that point, continuing until the remainder of the sound metal is no longer strong enough to carry the load, when final failure occurs.

When a force is applied to the end of a bar, that force is transmitted uniformly throughout the length of the bar. If there is any abrupt change in the sectional area of the bar, the lines of strain must pass around the point of irregularity, the stress being concentrated at the point of change. Deflection of a part takes place whenever a force or load is applied, regardless of how small the force. A mosquito walking along a two-inch shaft causes the shaft to deflect. The deflection is immeasurable, of course, but nevertheless actual deflection does take place.

Rotating shafts are constantly subjected to flexure which is continually being reversed by the rotation of the shaft, and to torsion which is also frequently reversed by starting and stopping and by the reaction of the



THE CINCINNATI SHAPER COMPANY, CINCINNATI, OHIO

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mechanical parts driven by the shaft. Failure usually occurs at the bases of keyways, at sudden changes in cross section diameters, and at sharp grooves and notches. Under cycles of reversed torsion, the endurance limit of metals range from 40 per cent to 70 per cent of the endurance

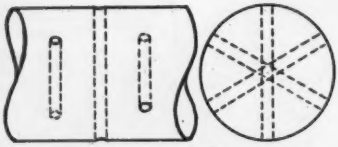

Fig. 1—A shaft with several holes through it has greater endurance than one with only one hole through it.

limit under cycles of reversed flexure.

The endurance limit of an oscillating or rotating part is the highest stress which the part is able to withstand regardless of how frequently the load is applied. The above statement must not be taken too literally, as obviously a part cannot be stressed until eternity in order to determine the possibility of failure; the load may be applied millions of times without failure, which may then occur after a few more applications. However, tests have shown that if failure does not occur within about ten million cycles, the part may be considered safe, assuming that no unusual strains are applied.

Fatigue strength or endurance limit bears a fairly close definite relationship with tensile strength, averaging about 50 per cent for steel and considerably lower for non-ferrous materials, but always being within a definite range for any given material. As tensile strength may be determined approximately by multiplying the Brinell number by 500, it is possible to determine the approximate endurance limit from a Brinell test. Cold working of metals increased the tensile strength and consequently the fatigue strength; with non-ferrous metals the percentage of increase in fatigue strength is less than the percentage of increase in tensile strength.

Localized stresses will always result where there is a change of section, but the stress concentration will be higher if the part is unsymmetrical. For instance, even a small radial hole through a shaft subjected to torsion or flexure results in a concentration of stresses at the edge of the hole, with possible failure at that point. The weakness of such a part is the result of the removal of metal; peculiarly enough, however, the remedy is to remove more metal. By drilling more holes through the shaft, as shown in Fig. 1, the endurance strength is increased due to the fact that the stress concentration is spread over a larger section. However, the torsional strength is not decreased, as the added holes do not reduce the minimum sectional area, which controls both the tensile and torsional strength.

Tests have shown that failure will usually occur sooner on a piece having a narrow, rounded bottom groove,

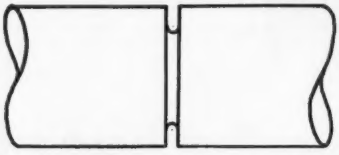

Fig. 2—A narrow groove tends to concentrate the stresses within a small area, whereas a wider groove, even with sharp corners, tends to distribute the stresses and thus provides greater strength.

as in Fig. 2, than on a piece with the same width of groove with a square bottom, as in Fig. 3. Although the square-bottomed groove has two sharp corners which logically should tend to start cracks, the higher fatigue strength is due to the fact that the stress is spread over a greater

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length instead of being concentrated in the round bottom of the groove. From the above example it must not be assumed that a sharp corner is

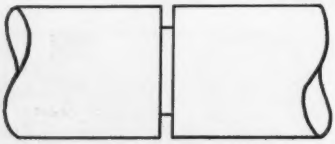

Fig. 3—Illustration of wide groove, referred to in caption Fig. 2.

better than a fillet in all cases, however; it merely indicates that a fillet is not the correct remedy in all cases. A shaft that is grooved on a radius several times the diameter of the shaft, as in Fig. 4, will have a fatigue strength approximately equal to that of a straight shaft with a diameter equal to the bottom of the groove. When the radius of the groove is reduced to about one-half

Fig. 4—A shaft with a groove of wide radius has approximately the same strength as a shaft of the diameter of the groove at the bottom.

the shaft diameter, as in Fig. 5, the fatigue strength drops to about 10 per cent less than that for a straight shaft of a diameter equal to the bottom of the groove.

In the case of a sharp V-groove, as in Fig. 6, which illustrates a condition that should be avoided whenever possible, the fatigue strength is less than in the case of the round-bottomed groove illustrated in Fig. 2. By providing a flat at the bottom of the groove, similar to a U. S. Standard thread, the strength is but slightly increased. A threaded part is reduced less in fatigue strength than a part of the same size having but one groove cut with the same tool, the reason again being the spreading of the stresses in the threaded part. The endurance limit of a threaded part will be approximately 50 per cent higher than that of a rod with a single groove of the same shape and depth. For the same reason a bolt on which the threads end just about at the edge of the nut is more liable to failure when subjected to repeated

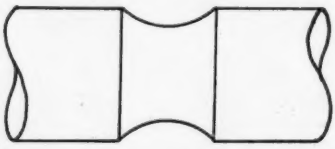

Fig. 5—When the radius of a groove is reduced to half the shaft diameter, the fatigue strength drops 10 per cent under that of the same shaft, grooved as shown in Fig. 4.

stress than if the threads were cut several turns longer than actually required.

Provision for generous fillets on all parts subjected to repeated stress loads is a good rule to follow wherever possible. However, for space reasons, it may not be possible to employ fillets large enough to provide the required strength. In such

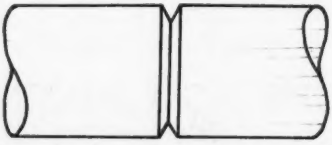

Fig. 6—The strength of a shaft with a V-groove is much less than that of the same shaft grooved as shown in Fig. 2.

cases, it may be possible to use undercut fillets. A case in point is a cam, machined integral with its shaft, which is subjected to severe torsional stress. As it is undesirable

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Its precision, quiet-running CJB bearing is completely cushioned from the all-metal housing with Neoprene, newest synthetic rubber, which is impervious to oil. Frictionless, labyrinth-type seals, also of Neoprene, provide real protection for the bearing.
Silence is the word on this new pillow block. Cost is very reasonable. Write for the Bulletin (shown at left) for complete details and prices.
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PILLOW BLOCKS

to reduce the width of the cam face or the length of the bearings, undercut fillets such as those shown in Fig. 7, prevent stress concentration in the corners between the shaft and the cam.

To prevent fatigue failure on a piece which has started to crack, or which has been accidentally nicked the crack should be filed or otherwise

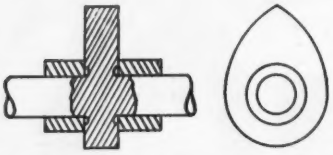

Fig. 7—Undercut fillets prevent concentration of stresses in corners.

machined slightly beyond the bottom of the crack on a generous radius, so that the lines of strain will pass smoothly around the injured section instead of concentrating at one point. Though this will not restore the original strength of the part, it will prevent progressive deepening of the crack. It is for this reason that it is customary to drill a small hole at the end of a crack which has developed in a circular saw or a bell.

When a part is suspected of having started to crack, it should be carefully inspected with a magnifying glass. A simple method of exposing cracks which sometimes cannot be seen with a magnifying glass is to rub the part with oil, which is then wiped off. The part is then coated with a thin paste of whiting or powdered chalk, mixed with water. If the part is then subjected to flexure or torsion, the oil will work out of the crack and can be seen where it stains the paste.

In cases where the design prohibits the use of fillets which experience says should be provided, experimenting may result in the selection of a material which is equal to the task, but in all cases the tests applied should equal the conditions encountered in actual service.

Ideal Catalog and Handbook. An 84-page catalog and handbook covering the line of products manufactured by the Ideal Commutator Dresser Co., 1031 Park Ave., Sycamore, Ill., has been prepared by this firm. The products discussed include various types of resurfacers, grinders, saws, milling cutters, files, scrapers, coil winder heads, wire strippers, wire cutters, electric cleaners, transmissions, marking equipment, soldering tools, pliers, volt indicators, fuse pullers, fuse clamps, solder lugs, voltage regulators, and so on. The latter part of the catalog is devoted to pages giving hints on commutator care, operation of direct current generators, definitions of electrical terms, and many engineering tables of valuable information.

Copy of the catalog will be sent to any mechanical executive who will address a request on his company letterhead.

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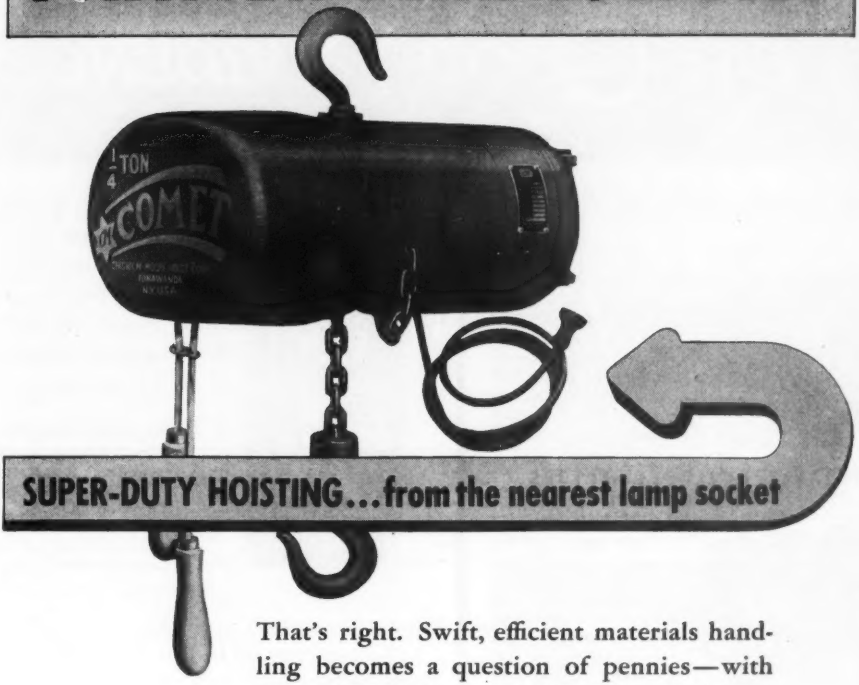

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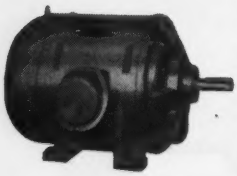

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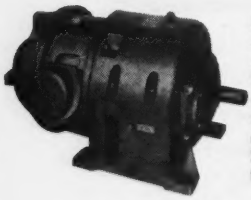

High speed motor efficiency for low speed machines — Simplifies installation, eliminates maintenance of belts, pulleys, sprockets, and chains. Delivers 96 to 98% of the motor's efficiency.

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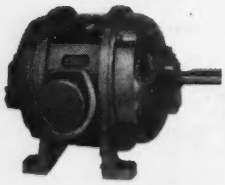

Built for a lifetime— Westinghouse standard a-c motors with rigid, one-piece frame, sealed sleeve bearings and Tuffernell insulation — money-saving features at no extra cost.

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NOFUZE CIRCUIT BREAKERS

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COMBINATION LINESTARTERS

Save cost on control installation — combine all needed motor and circuit protection into one compact package.

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$2550 return from $960 Investment

Six Westinghouse fan-cooled motors replace ordinary types—save 36 burnouts a year—slash maintenance almost to zero—and help speed up production.

Abrasive dust in the plant of the National Pressure Cooker Company was tough on ordinary open type motors. They were burning out about three every month. Repair costs piled up to $3000 a year — in addition to production time lost while machines were out of service.

The Westinghouse Industrial engineer suggested totally enclosed, fan-cooled motors. The first order cost $960. And since then, burnouts average less than two per year! A net saving of $2550 on a $960 investment!

If *you* want to save on maintenance and power—reduce outage time—cut manufacturing costs—make more profit—ask your local Westinghouse representative for suggestions. Or, write Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa. Address Department 7-N.

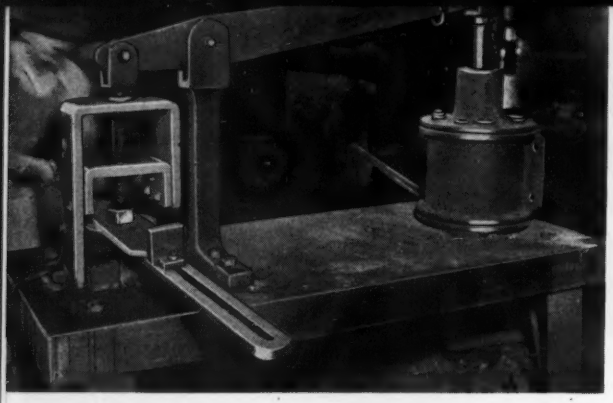
Dust and dirt can't hurt this Westinghouse totally enclosed gearmotor, operating buffing machine.

Cover on drive box on this grinder doesn't keep out metallic dust — but the casing on the totally enclosed motor takes it without flinching. Maintenance and repair costs practically zero.

There is a Westinghouse electrical wholesaler, industrial agent, or district office in all principal cities.

J-90214

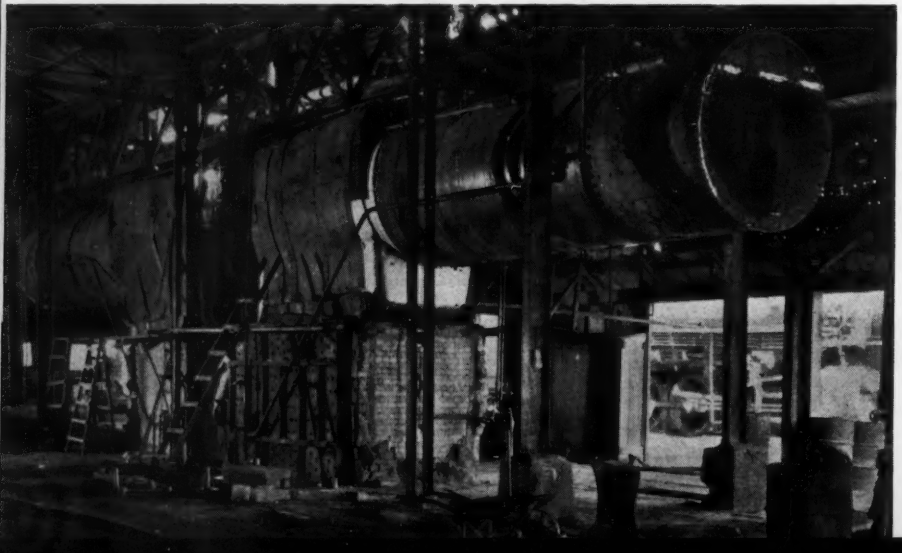
Motors and Control



Spring leaves are individually cut from spring steel and are formed and assembled with equipment built in the Monterrey shops. This press, using a discarded air brake cylinder for power, does a first-class job.

Making Car Springs in a Mexican Railway Shop

The spring leaves are heated in two furnaces upon each of which is set a locomotive boiler so that the heat from the furnace can be utilized to produce steam in the boiler. Each boiler has a capacity of 150 lbs. of steam which is piped to the steam hammers. Each boiler provides sufficient steam to operate four hammers.



Horizontal Air - Operated Forming Press. The "punch," which is made to the radius desired, presses the white hot spring leaf against a spring platen made of chain, thus affording sufficient resiliency to conform to the shape of the punch. The boy is shown holding a spring leaf in position for forming.

Springs for the cars of the Mexican National Railway System are made in the shops at Monterrey. Some of the equipment used in making springs is shown in these pictures.

After the leaves have been formed, they are reheated to 1,500 deg. They are then quenched in linseed oil and drawn at 700 deg. in this drawing bath. They are left in approximately 15 minutes, the time depending upon the thickness of the leaf. Forty-two springs are put into the bath at a time. The drawing bath consists of soda, potash, and water, heated by turning steam into the water.

Each spring is made of a given number of leaves of different sizes, held together at the center by a heavy clip. The air-operated machine shown here holds the leaves together so that the clip can be assembled to the leaves. The leaves are assembled in the proper order on the horizontal table of this machine and the ram is applied to hold them in position.

The mechanic is shown pulling a spring clip out of the furnace in which it has been heated to a white hot heat preparatory to assembling together a set of spring leaves to form a complete spring.

With the leaves assembled in their proper order and the pressure of the ram holding them in position for assembling the clip, the table is swung out from under the assembled leaves so that the spring can be swiveled to the vertical position as shown here. The illustration shows a white hot clip being driven down into place over the ends of the leaves.

With the spring leaves and center clip assembled together, the spring assembly is located in this press and pressure is applied both from the top and from the sides to square up the clip while it is still hot enough to be plastic. This press, operated by air, was also built in these shops.

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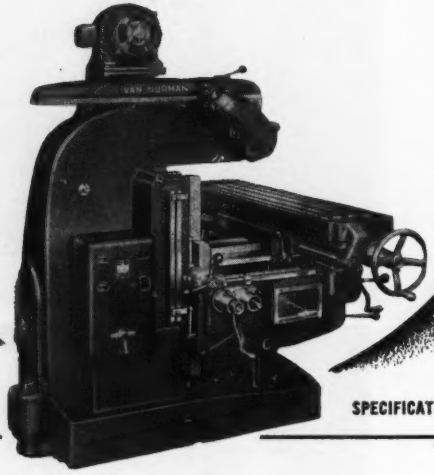

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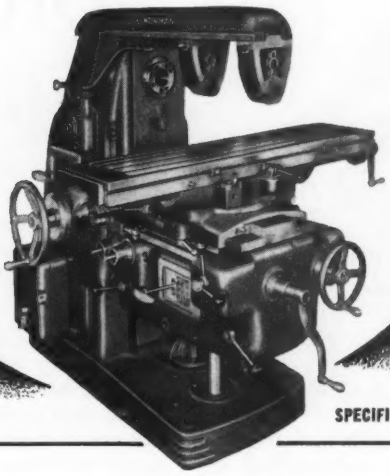

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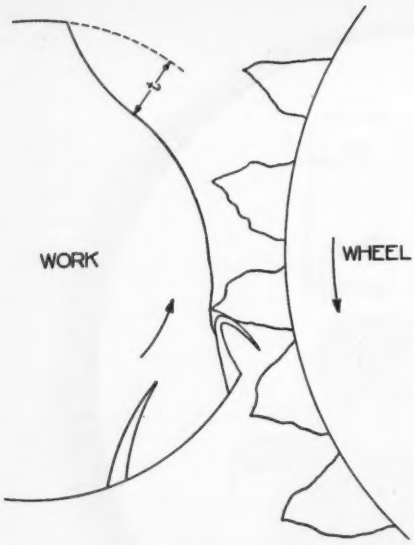


Fig. 1—Drawing illustrating, in exaggerated form, the cutting action of an external grinding wheel.

A Review of the Grinding Theories

By Albert H. Dall

Research Dept., Cincinnati Milling Machine Co.
Presented before the Metal Cutting Group of A.S.M., Cincinnati Chapter

METAL cutting is accomplished when a tool or tools, moving relative to the work, is forced into the space occupied by the work. In this, the grinding process is no exception. Therefore, it is only natural that any theory on grinding must be approached from the standpoint of the geometry of chip formation. From this study of chip formation various theories have been advanced based on assumed relations between the forces acting on individual grains as related to the maximum chip thickness or the maximum chip area. Before any intelligent attempt to analyze chip formation can be made, a cursory study of grinding wheel structure is necessary.

Structure of Abrasive Wheels

In general, a grinding wheel is an aggregation of abrasive particles held together by a bonding material. The bonding material does not occupy all of the space between the abrasives, but merely covers the grains. The bonding between grains is accomplished at the points of contact between the covered grains where the adjacent grain coverings become integral; thus the grinding wheel consists of a mul-

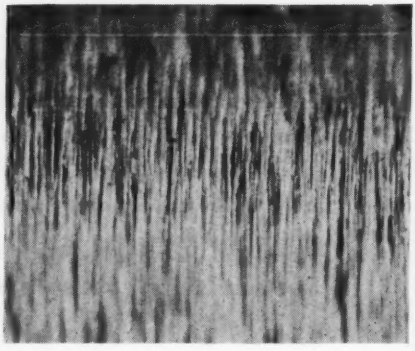


Fig. 2—Finish produced (X25) by a 60-grit wheel. The multiplicity of minute scratches seem to merge into one surface, producing visual smoothness.

tiplicity of abrasive grains or cutting tools which are held more or less rigidly to the whole. The rigidity of the connection between the grains depends on the amount of bonding material and also upon the distance between the grains. Fig. 1 shows, in exaggerated form, the cutting action of an external grinding wheel. Fig. 2 shows (X25) the resulting grind finish of a 60-grit wheel. Each projecting grit cuts a small groove in the work during its progress through its path interference. Visual smoothness is accomplished because the multiplicity of minute scratches seem to merge into one surface.

Grinding Wheel Grit and Bond

There are two types of abrasive grit materials in general use for cutting metals; aluminum oxide ($A1_20_3$) and silicon carbide (SiC). Emery and corundum are forms of aluminum oxide found in nature with varying degrees of impurities. Silicon carbide and aluminum oxide are manufactured by the use of electric furnaces and are marketed under various trade names. Pure silicon carbide has a hardness of about 9.5 on the Moh's scale while aluminum oxide is about 9. On this scale, diamond hardness has a value of 10 while cementite (FeC_3) is below 7.

The sieve method of separating the grits into size grades is employed after the abrasive is crushed, the pitch of the screen determining the size number of the grit. Thus a No. 60 grit must pass through a sieve whose wires are spaced 60 per inch. Sizes from 4 to 240 are measured by sifting through wire screen or silk while smaller grits are designated "flour size" and are graduated by flotation in liquid.

Many bond materials are in use today, vitrified, shellac, silicate, resinoid and rubber being the most common. The vitrified process has the widest application because the resulting wheels are more porous, which permits chip clearance and consequent "cool cutting" properties. Rubber and resinoid are used where high wheel strength is necessary. The field of grinding presents such a wide variety of conditions that each of the above bonds are found to be applicable in some cases in preference to the others.

The grade of an abrasive wheel is

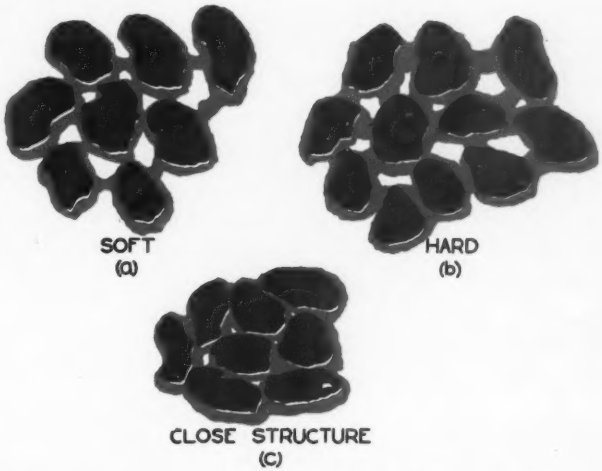


Fig. 3—Illustration of ratio of bond material to grit material, and of grit spacing. (a) Soft grade. (b) Harder grade. Grit spacing is same as shown at a, but ratio of bond to grit material is different. (c) Close structure compared to a or b.

determined by the ratio of bond material to grit material, while the term "structure" refers to grit spacing. Fig. 3a shows a soft grading as compared to Fig. 3b. In each case, the grit spacing is approximately

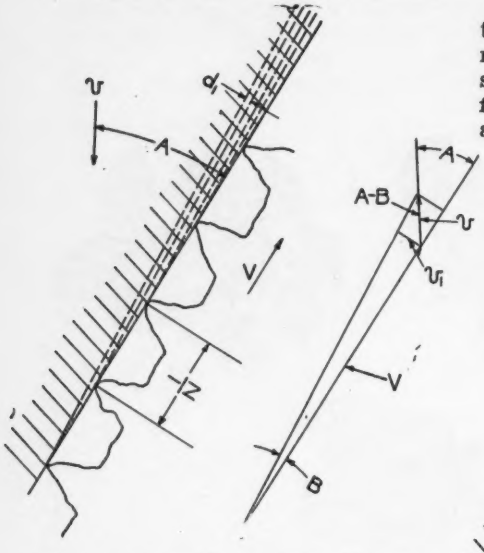


Fig. 4 and 5—Diagrams illustrating path followed by abrasives relative to work.

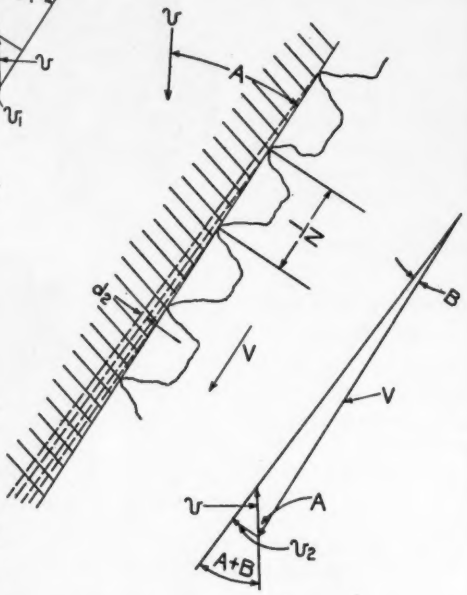
equal but with different ratios bond to grit material. Figure 3c, however, is a close structure as compared to Fig. 3a or Fig. 3b.

It is evident from the foregoing that the combinations of grits, grades, bonds and structures are almost without limit. However, the exact choice of wheel is seldom necessary, since wheel action is very greatly affected by other conditions such as wheel speed, work speed, traverse rates, work diameter, wheel diameter, grinding fluid and truing conditions.

Guest Theory

In September, 1914, James Guest presented to the British Association for the Advancement of Science a theory on grinding. Mr. Guest approached his theory from the standpoint of the geometrical consideration of the maximum chip thickness normal to the chip.

Figures 4 and 5 show the abrasives traveling relative to the work. The relative path of wheel to work is shown by the parallel paths. The time for one grit to reach a given point after the last one passes that point is



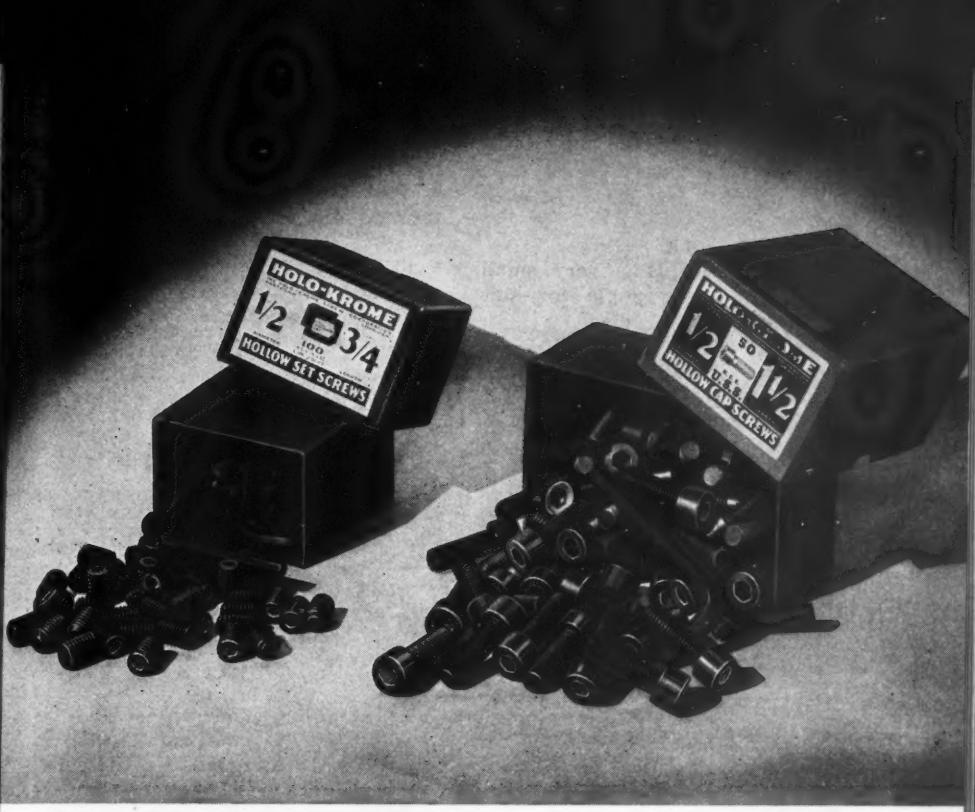
(1) $\frac{1}{NV}$ = time

where $\frac{1}{N}$ = pitch of grits

V = velocity of grits.

The normal velocity v_1 Fig. 4 and v_2 Fig. 5 times the time equals the chip thickness d, thus

(2) $\frac{v_1}{VN} = d_1$ $\frac{v_2}{VN} = d_2$



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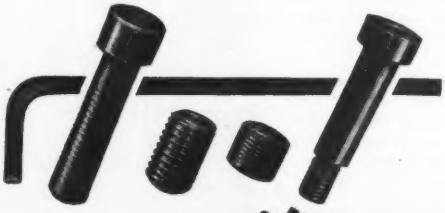

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But from the relative velocity diagrams,

(3) $v_1 = v \sin (A - B)$

$v_2 = v \sin (A + B)$

Since the angle B is very small, Guest neglects this angle for simplicity, thus

(4) $$d = \frac{v \sin A}{VN}$$

Figure 6 shows the application of this principle to external cylindrical

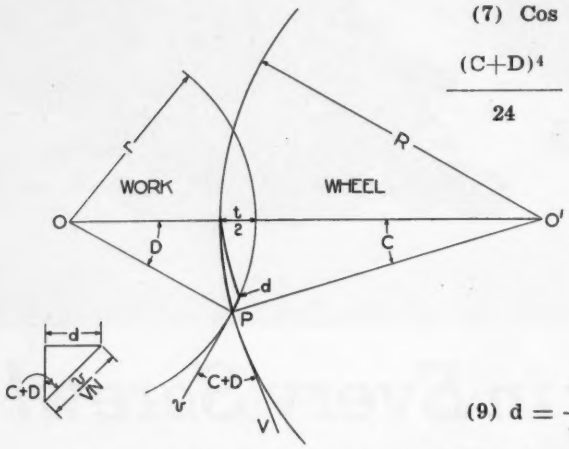

Fig. 6 — Diagram illustrating application of principle of formula to external cylindrical grinding.

grinding. The time for succeeding grains to pass a point is again,

$$\text{time} = \frac{1}{NV}$$

The normal velocity is,

$v_1 = v \sin (C + D)$

Therefore,

(5) $$d = \frac{1}{NV} v \sin (C + D)$$

It is obvious that this result can be obtained without resort to relative velocities.

By the use of the cosine law, the cosine (C + D) can be obtained in terms of the depth of cut $\frac{t}{2}$ and the radii R and r: If the cos (C + D) is expanded into a series of angle (C + D) is found approximately in terms of R, r, and t. Thus

(6) $$\text{Cos } (C+D) = 1 - \frac{R+r}{Rr}\cdot\frac{t}{2} + \frac{t^2}{8Rr}$$

(Cosine law)

(7) $$\text{Cos } (C+D) = 1 - \frac{(C+D)^2}{2} + \frac{(C+D)^4}{24}$$

(8) Therefore,

$$(C+D)^2 = \frac{R+r}{Rr} \cdot t$$

Since angle (C + D) is small sin (C + D) is assumed to be equal (C+D) (Radian measure) substituting in (5)

(9) $$d = \frac{v}{VN} \cdot \sqrt{\frac{R+r}{Rr} \cdot t}$$

The term d is for maximum chip thickness. A further hypothesis of Guest is that the maximum chip area varies as the squares of the maximum chip thickness when the grain is assumed to be roughly triangular in shape see Fig. 7. Thus

(10) $$d^2 = \frac{v^2}{V^2N^2} \cdot \frac{R+r}{Rr} \cdot t$$

The Guest theory then assumes that the force acting on the grain is proportional to d^2. Therefore, the tendency for grains to break or dislodge will vary with the quantity.

(11) $$\frac{v^2}{V^2N^2} \cdot \frac{r+R}{Rr} \cdot t$$

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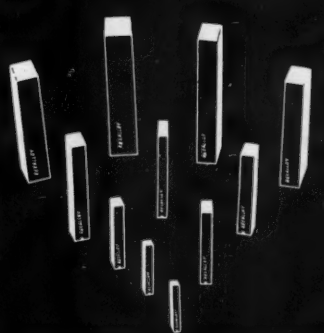

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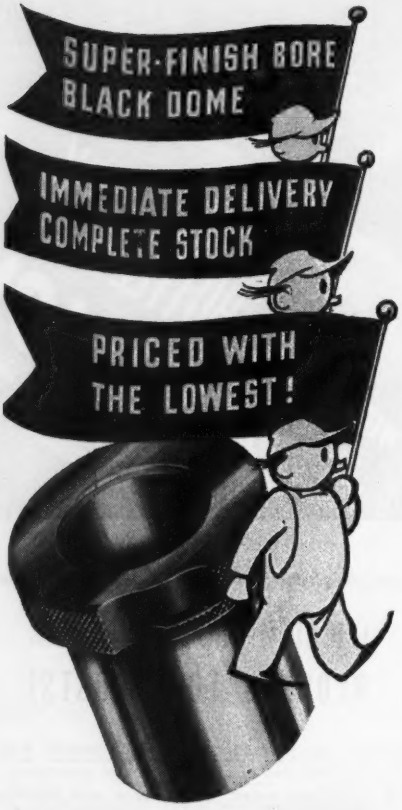

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grinding will result in the expression

$$(12)\quad \frac{v^2}{V^2N^2} \cdot \frac{r-R}{Rr} \cdot t$$

The conclusion of the theory therefore is that the ratio of work velocity to wheel velocity $\frac{v}{V}$ has a large influence on wheel action while the depth of cut has a direct effect. For

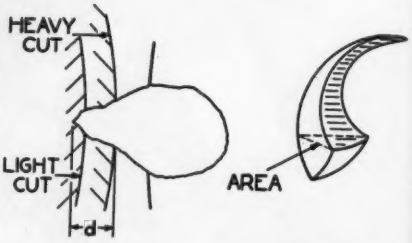

Fig. 7 — Diagram illustrating hypothesis (Guest) that maximum chip area varies as the squares of the maximum chip thickness when the grain is assumed to be roughly triangular in shape.

large wheels with small work, the wheel diameter has little influence while work diameter has a large effect. In internal grinding the velocity ratio and depth of cut affect wheel action in similar manner, while the wheel diameter variations will in most cases have a greater effect than work diameter variations.

Alden's Theory

Referring to Fig. 6, it was noted previously that the quantity "d" can be obtained by direct geometrical considerations (see small insert triangle). Mr. George Alden presented a paper to the A. S. M. E. in 1914, in which the grain depth of cut theory was proposed. His formula is

$$(5)\quad d = \frac{v}{VN} \sin (C + D)$$

which is in agreement with Guest

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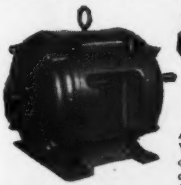

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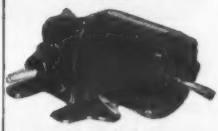

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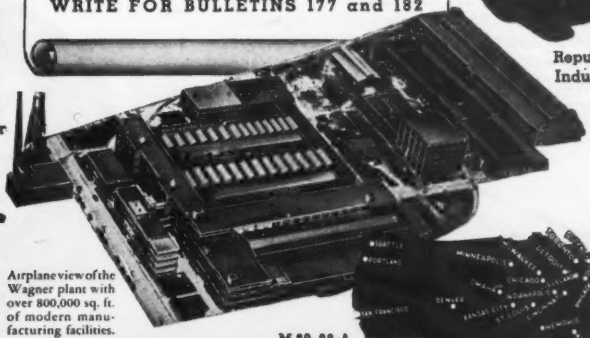

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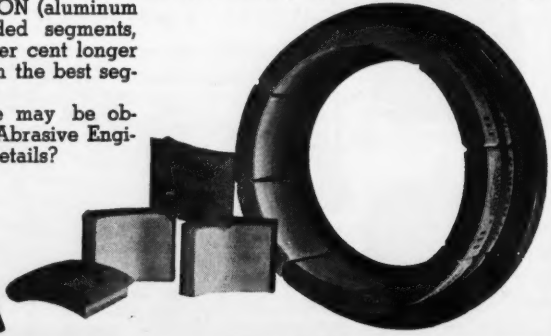

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Equation 5. However, the term sin (C + D) was tabulated in terms of wheel diameter, work diameter and depth of cut. The tabulated values in Alden's work check very closely with calculated values from Guest's formula.

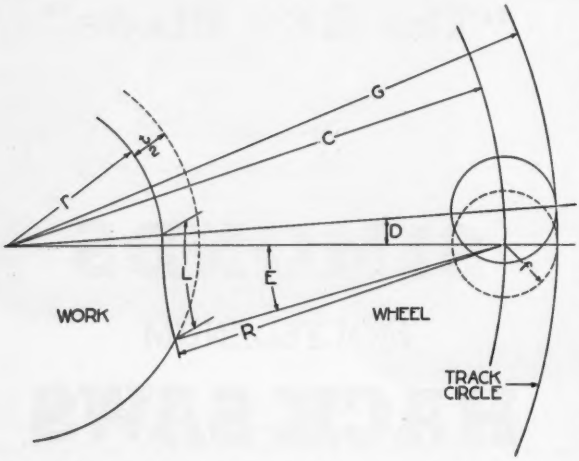

Fig. 8—Diagram illustrating principle of geometrical method of attack.

Alden's theory assumes that wheel action (force on grain) varies as the "grain depth of cut."

Hutchinson's Theory

In December, 1937, Roland V. Hutchinson presented a paper to the S. A. E. which appeared in the S. A. E. Journal in March, 1938. Mr. Hutchinson's excellent presentation of the entire subject of grinding includes consideration of work heating, chip formation, coolant, dressing and cam grinding. A mathematical derivation of an expression for average chip thickness was deduced. This derivation differentiates between the condition of the so-called up-cut and down-cut (in down-cut, the work travels opposite to the wheel at the point of contact and up-cut the work travels with the wheel). Fig. 8 shows the geometrical method of attack. In this method the work is regarded as rotating around the work at an angular speed equal to the work speed. To obtain this result geometrically, a rolling circle is placed on the wheel center in contact with a track circle. The relation of these circles is given by,

$$(13)\quad \frac{f}{g} = \frac{n}{N} = \frac{D}{E}$$

where n = work speed r.p.m.
N = wheel speed r.p.m.

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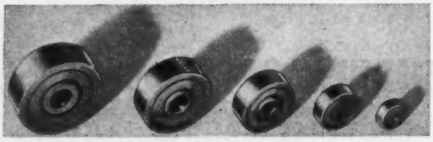

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The length of chip is derived in this paper as

$$(14)\quad L = (R \pm r\,\frac{n}{N})\,\frac{Rr}{R(R+r)}$$

The plus sign is for up-cut and the minus is for down-cut. Using the assumption that rD times $\frac{t}{2}$ is the volume of chip, and dividing this value

Fig. 9 — Photomicrograph of surface partly superfinished, showing variation in depth of cut of individual grains.

by L, the average length of chip, the result is the average chip approximately assuming the chip is triangular in shape. The equation for average chip thickness will then be

$$(15)\quad d = \frac{rn}{RN \pm rn}\,.\,\frac{t}{2}$$

The term r in the numerator was omitted in Mr. Hutchinson's paper. However, for dimensional consistency, this term is necessary and a check of his derivation showed the point at which it was dropped. Since the angle D is the rotary movement of the wheel axis while a point on the wheel is moving the distance L, the assumption is that grits have spacing of L distance. To accommodate the formula to other grit spacings, such as $\frac{1}{n}$ as indicated in Guest's and Alden's work, the angle should be modified as follows:

$$(16)\quad D_1 = D\,.\,\frac{1}{nL}$$

If this value is used in Mr. Hutchinson's derivation and if the effect of down and up cut is neglected the result will be

$$(17)\quad d = \frac{1}{2}\,\frac{v}{Vn}\,.\,\frac{R+r}{Rr}\,t$$

which is one half the value obtained by Guest for the maximum chip thickness, proving that the bases of the derivations are in agreement. Mr. Hutchinson's theory contains other valuable contributions to the theories of grinding such as equation for average chip thickness for surface grinding and modifications of the plunge cut formula (15) for traverse grinding which shows that the length of chip varies according to the equation,

$L_1 = \sec \Theta\,.\,L$

where L = plunge cut chip length
L_1 = traverse chip length
Θ = helix angle of feed on work

Note: In centerless grinding, Θ would correspond exactly to the regulating wheel feed angle.

Krug Theory

The technical magazine Machinenbau, published in September 1925, an analysis of the geometrical consideration of grinding by Dr. C. Krug. His simplified formula for maximum chip thickness is given for plunge cut external grinding as

$$(18)\quad d = (\frac{2R}{r} + 1)\,\frac{v}{V}\,\frac{rt}{2}$$

all notations being the same as previous formulae. However, in Ma-

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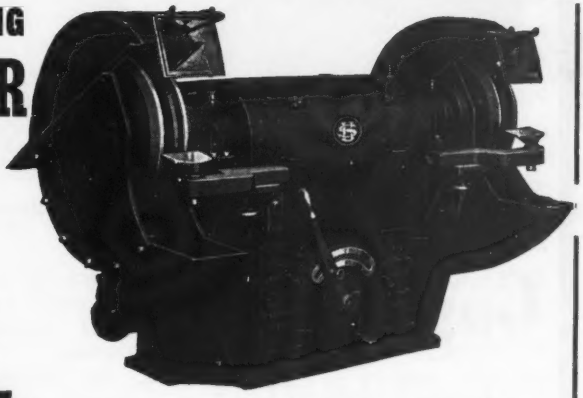

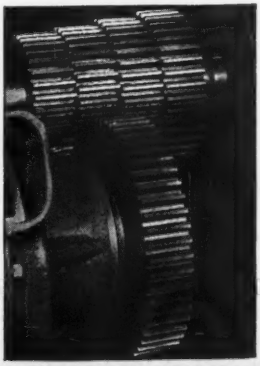

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chinebau, January 1933, Mr. A. Hoffman points out errors in Dr. Krug's derivations and further shows that values obtained with Krug's formula were of a different order than those obtained with Guest formula. Further, the assumption in Krug's formula is that the grit spacings are equal to one half the arc of contact.

In his reply to Hoffman, Krug

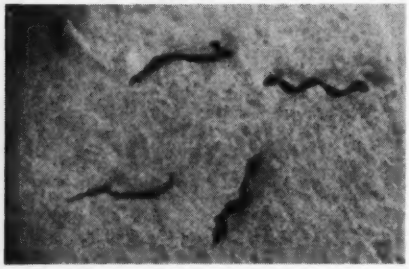

Fig. 10—Microphotograph of grinding chips of "continuous" type.

points out the chip thickness is not as important as the plastic flow conditions obtained when the chip is formed.

In his paper (Machinenbau, September 1925) and later in another paper (Zeit. V. D. I., August 1927) Dr. Krug analyzes the structure of grinding wheels. In this analysis, the grains are regarded as spherical in shape. He shows that the grains can be packed in some manner between two extremes, i. e., where the centers of the contacting grains are disposed on the corners of a cube or where the centers of the grains are placed on the corners of a tetrahedron. From these assumptions the analysis shows that the grits can only occupy from 52 to 56 per cent of the total volume. However, according to Krug, the remaining space cannot be occupied entirely by bond since clearance space for chip formation must be provided. He arrives at the conclusion that each

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grit must have only a coating of bond (Fig. 3). With grits in contact, Dr. Krug analyzes the force to dislodge a grit for various thicknesses of coating where the grits contact and grit coats merge to form a bond. The two conditions where the bond is in tension and in bending are considered.

For bending the ratio of resistances to fracture for two layer thicknesses S_1 and S_2 is

$$(19)\quad \frac{W_2}{W_1} = \left\{ \frac{S_2^2 + 2dS_2}{S_1^2 + 2dS_t} \right\}^{3/2}$$

where

d = diameter of grit

S_1 = thickness of bond layer for W_1

S_2 = thickness of bond layer for W_2

$\frac{W_2}{W_1}$ = ratio of resistance to bond fracture.

For the case of fracture in tension

$$(20)\quad \frac{R_2}{R_1} = \left\{ \frac{S_2^2 + 2dS_2}{S_1^2 + 2dS_t} \right\}^{2}$$

where $\frac{R^2}{R^1}$ is the ratio of resistances to fracture for the two bond layer thickness S_1 and S_2.

The failure of the bond in shear is not treated although it is obvious each exposed grain will have five or more bonding contacts. When a grit breaks out, these bonding contacts must all fail in bending, compression, tension, shear or combinations of these, depending on the direction of the force in relation to the plane of the bond.

Relation of Theories to Practice

As Mr. Hutchinson states, the study of grinding is one of transients. The grinding operation consists of thousands of individual events, few of

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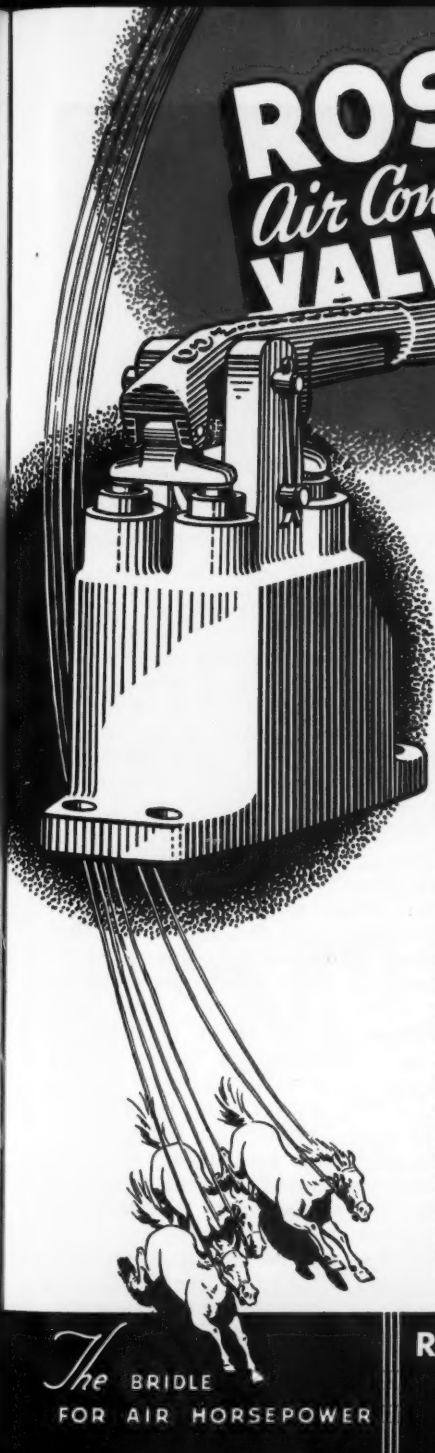

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which are exactly similar to each other, but which integrate into a statistical summation. The target of the theories is the statistical average of these events. Although the implications of the theories are born out in practice in a qualitative way, experimental data is lacking to determine whether the theories are even roughly quantitative. It is a well known fact that wheels act harder when the wheel surface speed is increased and softer when the work speed is increased. In general, it is known that small work diameters require harder wheels for the same action as that obtained on larger work. Therefore, the theories can be used as guides until such time as actual proof is presented.

It is quite obvious that the cutting grains of a wheel are extending at every conceivable distance within the limit of the depth of cut. Fig. 9 shows a photomicrograph of a surface which is partly superfinished, illustrating the variation in depth of cut of individual grains. Even though many of the grains must be cutting in geometrical relation to the work as illustrated by the theories, the statistical average is again illustrated to be of greater importance.

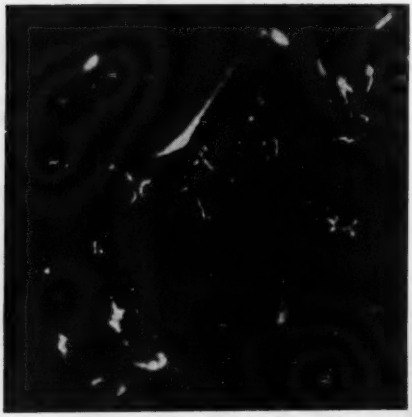

Fig. 11—Photograph of random grinding chip sections.

In the theories, no cognizance is taken of the effect of plastic flow of the chip. In the paper presented by Hans Ernst and M. Martellotti, the "Formation and Function of Built-Up Edge" (Mechanical Engineering, August 1935) and a later paper, "Physics of Metal Cutting" by Hans Ernst (Detroit meeting A. S. M., 1938), a detailed study of chip flow is treated. In the latter paper all metal cutting chips are divided into three types. The second type called the "continuous chip with continuously escaping compressed layer adjacent to the tool face" would seem to be the most likely to occur in grinding because of the high speeds and shallow depths of cut. On the other hand when it is considered that negative rake angles at the cutting points are inevitable,

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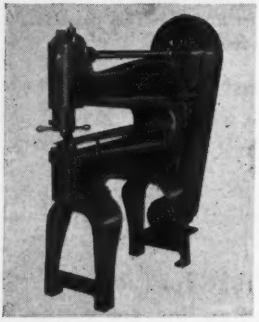

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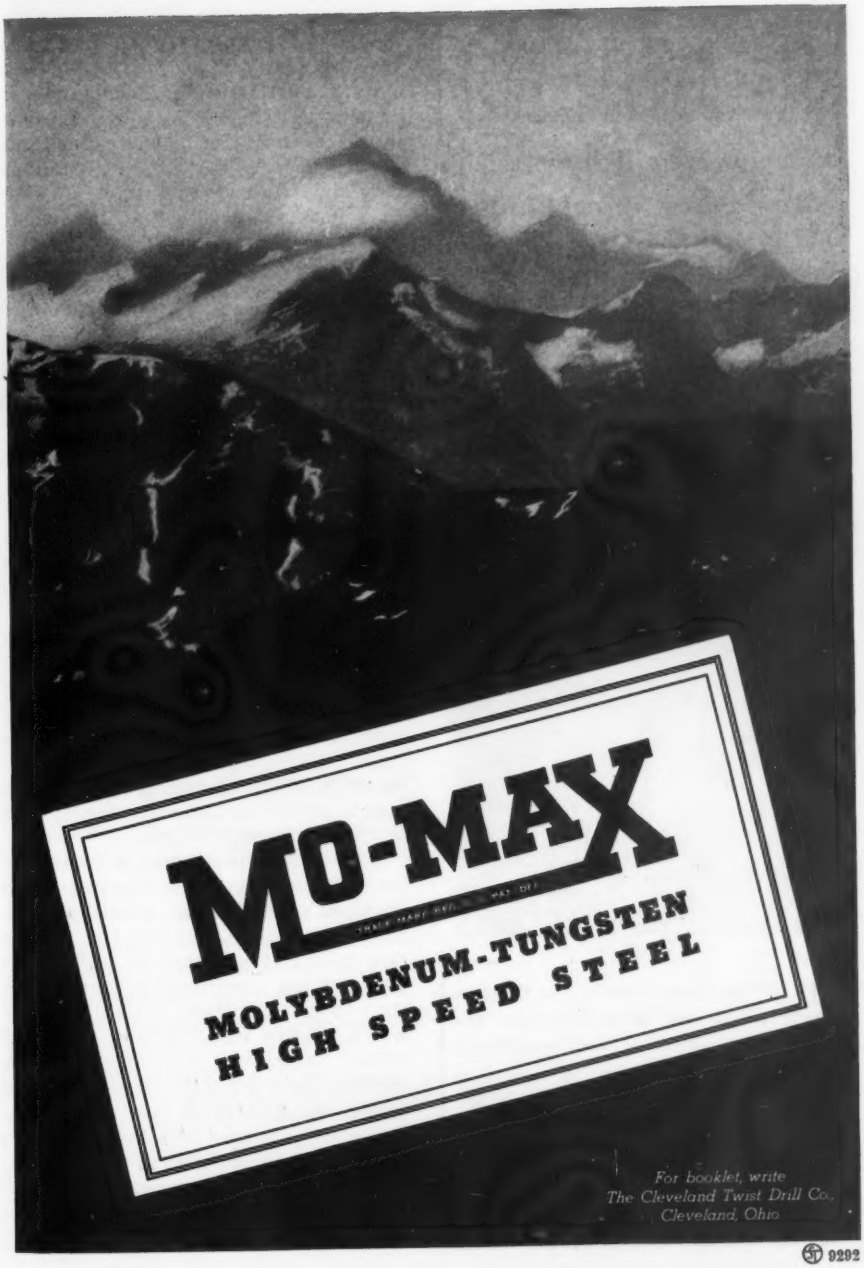
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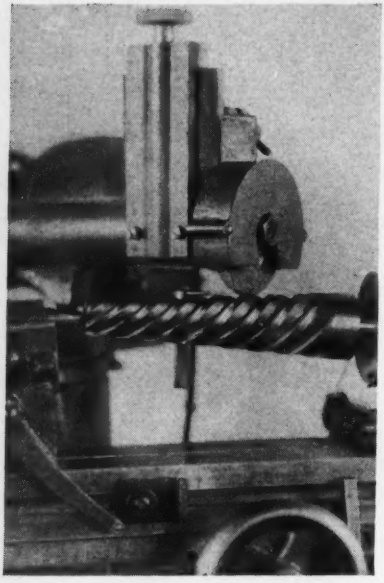

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the third type, i. e., built-up edge type, would appear to be the more probable. Mr. Ernst's paper shows most conclusively that when these built-up edge conditions are encountered, the result is a very ragged finish. However, the cutting grains are very narrow and the probability of chip flow sidewise alters the whole

Fig. 12—The central chip in this photograph shows distinct segments for which ductile material indicates the "built-up edge" type.

aspect of rake angles. Fig. 10 shows a microphotograph of grinding chips which apparently have type 2 characteristics.

Fig. 11 shows several random grinding chip sections. The large section is remarkable because its shape is approximately that of the geometrical configuration determined by the theories. The central chip in Fig. 12 shows distinct segments which for a ductile material indicates the type 3 or "built up edge" type.

It is evident that wheel action must be affected by such variables as "coolant" and truing conditions because of their effect on the plastic flow of the chip. Thus, in addition to the working conditions recognized in the theories, other variables exist which modify wheel action. It would seem, therefore, that considerable latitude exists in the choice of the proper wheel for a particular job. However, if proper wheel action is obtained at the expense of production, it is plain that this apparent latitude can only be used to point toward the optimum.

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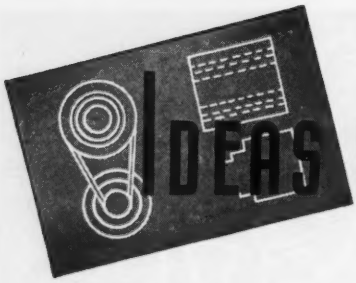


IDEAS FROM READERS

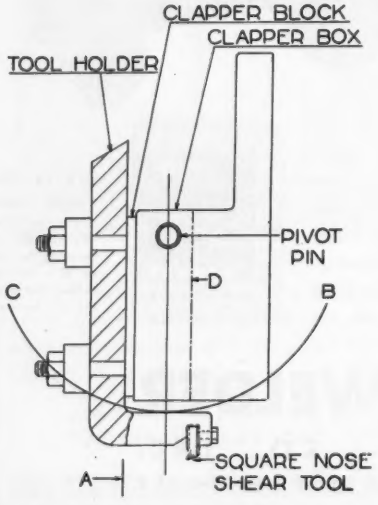
Planer and Shaper Tool Design

By F. J. WILHELM

THE writer presents here the design of a clapper box and tool so made that the cutting edge of the tool is in line with the rear edge of the clapper block **D**, and not at the rear of the tool in line with the line **A**, as has been advocated in previous discussions of this subject.

If the arc line **C—B** is pivoted where it intersects the center line, pulling-in of the cutting edge will be eliminated as it is past the perpendicular line of the arc. The added strength from front to rear provides the necessary spring, comparing with that obtained in the usual goose-neck tool. The shear should, of course, be into the cut. By rounding the starting edge on the work and using a little lubricant or coolant, an excellent finish can be produced on steel.

In order to make it possible to obtain an unusually good finish on steel with the square nose tool, it is the writer's opinion that shaper and planer manufacturers could put a one-quarter degree angle on the surface of the clapper box **D** to act as a positive rest for the clapper box. This feature would positively eliminate pulling-in of the cutting edge, and it only takes a few thousandths of an inch of pull-in to ruin a good finishing cut.



Design for Planer or Shaper Finishing Tool

Simple Method for Closing Holes in Castings

By W. F. SCHAPHORST

THE drawing herewith illustrates a simple and quick method that has been successfully employed by the writer to close holes in castings by the use of babbitt metal. The method consists simply of placing the section of casting with the hole in it into a box of sand as shown, pushing away enough of the sand from the edge of

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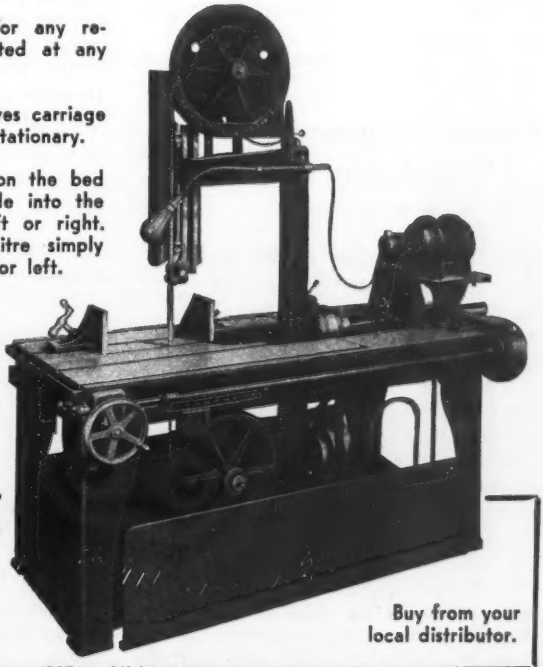

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the hole so that the babbitt metal, when poured, will clamp tightly around the hole on the inside and outside of the casting in the manner shown.

For temporary work, the babbitt

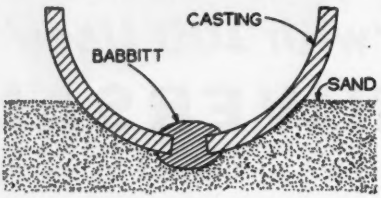


Illustration Showing Method of Closing Holes in Castings by the Use of Babbitt Metal

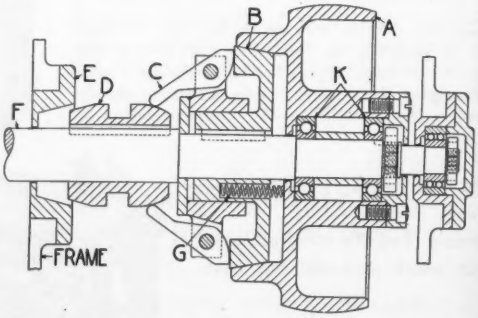
method of closing holes has been used with great success and, in some cases, babbitt repair jobs have been known to perform as long as 20 years. If babbitt metal is not available, lead or a similar metal having a low melting point can be used.

Clutch Equipment with Quick-Acting Brake

By J. R. WHITTLES

THE quick-acting clutch and brake illustrated in the drawing herewith is designed so that it can be used to stop the shaft **F** from rotating while in use in a machine. In order to carry the load, the shaft is supported on ball bearings at each end. Part **A** is a pulley which is driven by means of a flat belt. This pulley rotates freely about the shaft **F** and is suported by the ball bearings **K**. At the side of the pulley, and cast integral with it, is a taper clutch into which fits a cone, **B**. The cone is keyed to the shaft **F** and is provided with springs **G** spaced inside the hub to release the cone face from the taper in the puley. **A**. The fingers **C**, which ride the cam face of the clutch spool **D**, are used to force the cone **B** into the taper of the pulley and to clamp the cone tightly so that the load can be carried. The clutch spool **D** is made with a cam face at one end and a taper cone at the other, and is keyed to the shaft **F**. By means of a lever (not shown), the spool can be slid back and forth over the shaft in such a manner as to operate the clutch fingers along the cam surface at one end or to force the cone taper into the taper of the part **E** at the other end.

In operation, the clutch spool **D** is operated to the right along the shaft **F**, causing the fingers **C** to be pivoted against the cone **B** and thereby forcing the cone into the taper of the driving pulley **A**. As the cone **B** is forced into the taper of the driving pulley, the shaft **F** begins to rotate. To stop the shaft from rotating, the spool **D** is moved to the left along



Drawing showing quick-acting clutch and brake for stopping rotation of shaft.

the shaft until the tapered end of the spool is forced into the taper of the stationary part **E**, thereby forming a brake which stops the rotation of the shaft.

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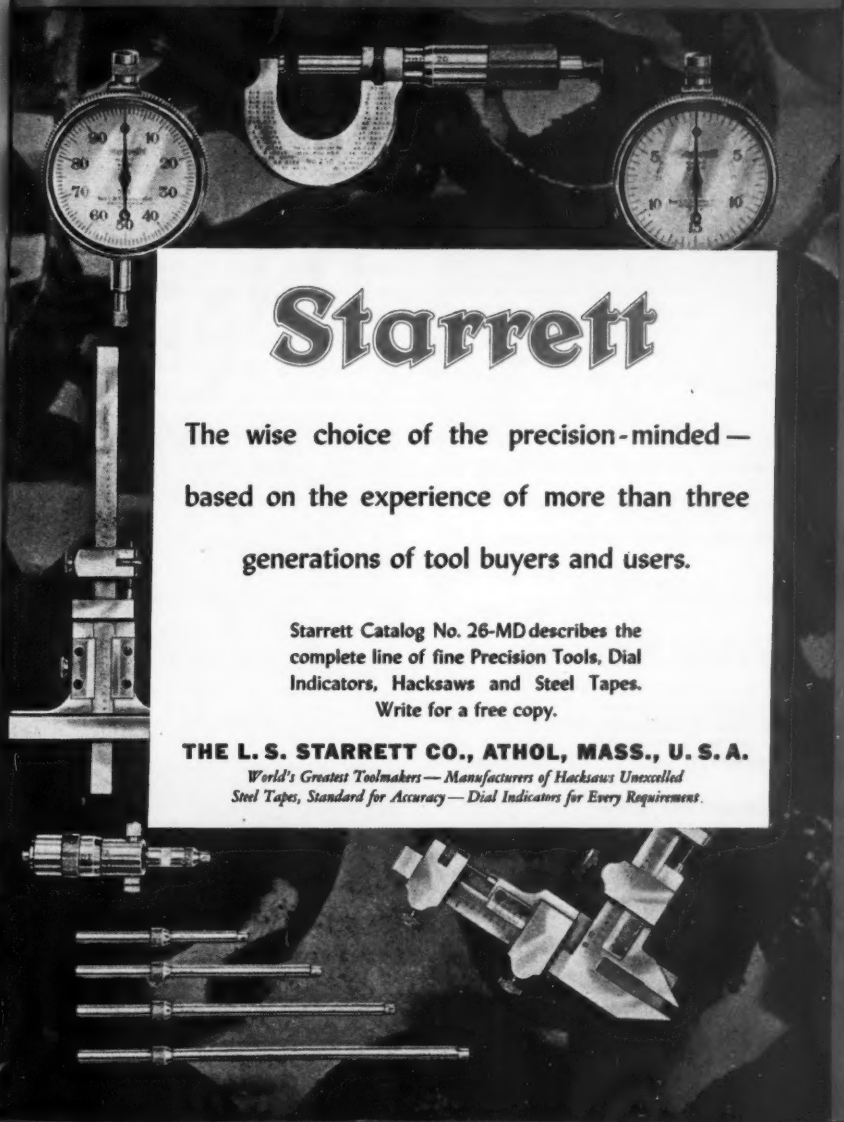

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Design of Arc Welded Blanking Dies

By H. E. TELGHEIDER

A DESIGN for arc welded blanking dies which is said to effect important savings over a previous method used is described herewith. The drawing is divided into two parts, Fig. 1 and Fig. 2.

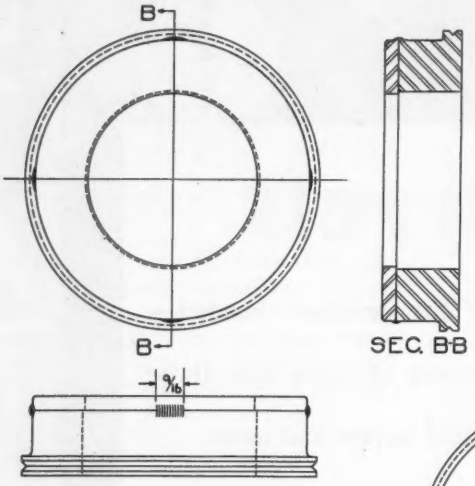

Fig. 1 (Above)—Drawing showing old design of a blanking die.

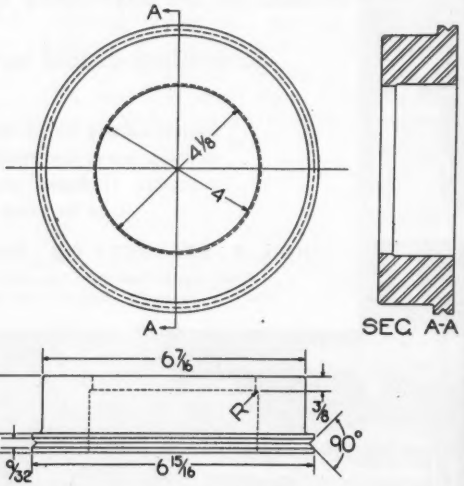

Fig. 2 (Right)—Drawing illustrating new design of a blanking die, in which arc welding is employed to advantage.

Figure 1 illustrates the design of a blanking die which was used prior to the design of the blanking die shown in Figure 2. The die shown in Fig. 1 was of tool steel, turned on the lathe, hardened and ground. A radius was turned in the die to prevent cracking during the hardening process.

Figure 2 illustrates a new design of the blanking die whereby the top plate alone is made of tool steel, the rest being of hot rolled steel. It is machined in the same manner as the die illustrated in Fig. 1, but only the tool steel top plate needs to be hardened. After hardening and grinding, the plate is fastened with C-clamps to the hot rolled steel base and the two parts are electric arc welded in four places. By using an electric arc welder, the heat is applied to such a small area that it does not affect or lower the efficiency of the die.

It can readily be seen that it is easier to harden the small top plate than the complete die as was necessary in the case of the die illustrated in Fig. 1. The old die is also more subject to cracking during hardening than a die of the new design.

In production, where blanking dies are used constantly, they must be replaced from time to time and it is in production work that the new type of die has an advantage over the

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old. After the old type die has been sharpened and ground down a number of times, it has to be replaced by another complete die. When the new type die wears, all that is necessary is to grind off the four welds and replace the top plate. The base can be used repeatedly.

The dimensions used in the drawings were employed by the author to give the reader an idea of the size of that particular die. This die may be made to any size desired.

Oilstoning on the Filing Machine

By ERNEST FOLDVARY

THE oilstone is often used on hardened pieces that have been ground, particularly on die work, to remove grinding wheel marks and provide smooth surfaces where they are needed. In die manufacturing, the die cavities require oilstoning after the parts have been hardened because a certain amount of stock is often left on the workpiece to take care of any hardening that may occur in the hardening process. Where complicated shapes are involved, the additional stock thus left assumes greater importance inasmuch as extra care must be taken that warpage in hardening may not ruin the result of many days of labor.

Design of tool for oilstoning on the filing machine.

Another important reason for the oilstoning of dies is that a die with stoned surfaces will be a much more durable die, producing more pieces per grind and offering much less opportunity for surface cracks. How-

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ever, in many cases oilstoning is omitted on account of the expense involved, due to the fact that the operation is usually performed by hand and requires much experience and skill.

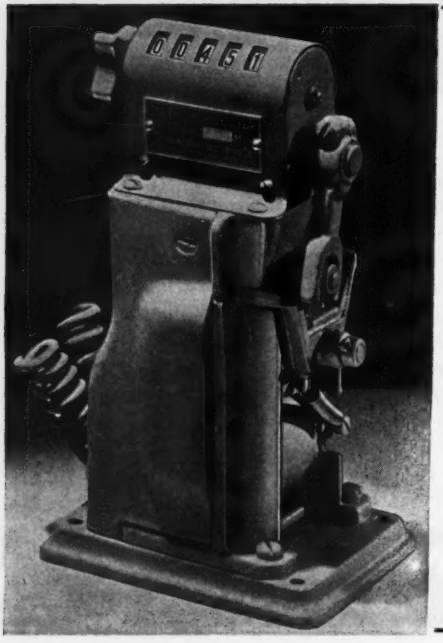
The accompanying illustration shows the design of a tool which, used in connection with a filing machine, speeded the stoning operation to such an extent that oilstoning is no longer regarded as a tedious, expensive job. The tool consists of the holder **A**, dovetailed to take the stone **B** as shown, and having the approximate dimensions of a standard file. The stone is held in position by a clamp, which in turn is held in place by the screw **C**. The end of the tool is cone-shaped and the tool is used in an ordinary filing machine in the same manner as the usual file.

The tool is simple to make and will soon demonstrate its worth.

Westinghouse Gearmotors. Westinghouse gearmotors, self-contained drives consisting of a high speed Westinghouse motor and necessary speed reducing unit, are illustrated and discussed in a booklet recently published by the Nuttall Works, Westinghouse Electric & Manufacturing Company, Pittsburgh, Pennsylvania.

Various types are available: single reduction gearmotors, with standard gear ratios up to and including 5 to 1; double reduction gearmotors, with standard ratios, 5.6:1 to 10:1, inclusive; double reduction gearmotors, with standard ratios, 11.2:1 to 40:1, inclusive; and triple-reduction gearmotors, with standard ratios, 45:1 to 200:1 inclusive. Gearmotor ratings are available from ¾ to 75 h.p. with any of the three standard motor speeds from 1,750 to 870 r.p.m. There are 46 standard gear ratios available with each of the motor speeds, giving output speeds that range from 4.4 r.p.m. to 1,550 r.p.m. Additional speed changes are possible by using suitable pulleys, sprockets and chains, or pinions, on the output ends of noncouple drives.

Copies of this booklet, descriptive data 3610, free upon request.



Electric Counters Fix Labor Costs

Punch press operators are most fairly paid by strokes of the press as recorded on Electric *Productimeters*. A contactor acting only when metal is in the press is wired to the counter on a nearby wall where it is free from vibration and gives true piece work figures indefinitely. Electric *Productimeters* can be adapted to almost any contingency such as paired press operation with one or both working at any time.

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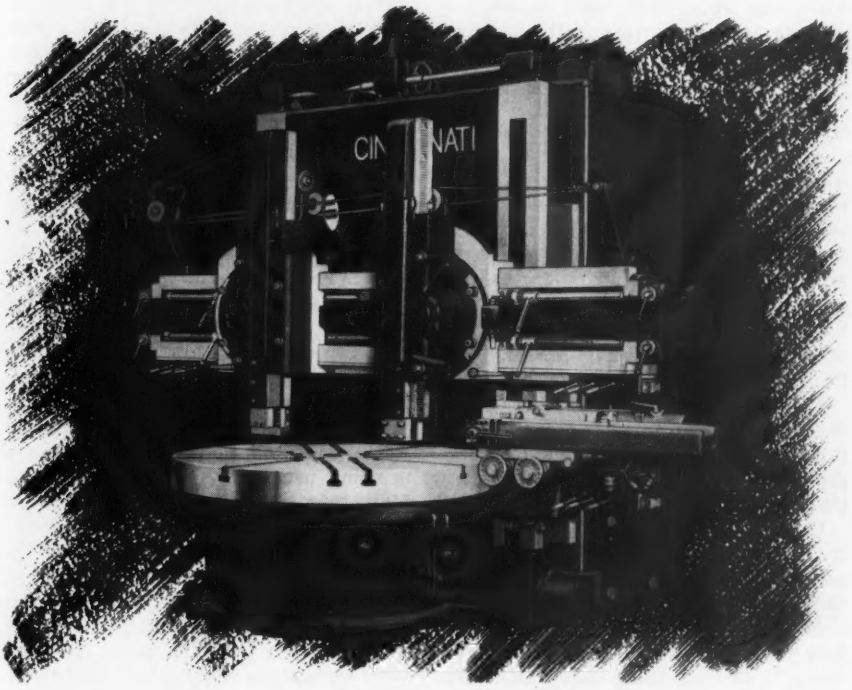

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Over the Editor's Desk

One Dollar in Five

BY the time this issue is in the hands of the readers, the November elections will be over and the American voter will have taken his part again in determining the policies of his country. Or, at least, he *should* have taken his part.

The laws by which the American citizen is governed are made by the men who are elected by that same American citizen. If he elects good men, he will get good laws. If he elects incapable or erratic men, he will find himself hampered by crazy, erratic laws. And inasmuch as the great bulk of legislation involves the spending of money in one way or another, bad legislation is usually reflected in increased taxes.

During the past half-dozen years the tax tide has steadily risen, and if it continues to rise America will find itself struggling desperately to keep its head above water. And for what?

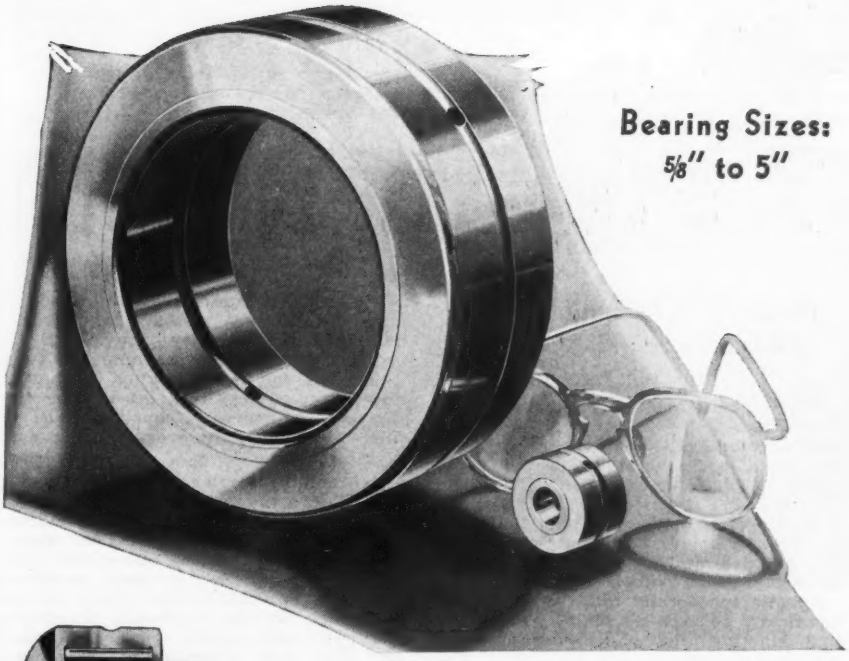
Government costs money, and when it is good government no thinking person resents paying his share of the cost. But when the cost of government increases by millions of dollars year after year, it is time to ask "why." During these last half-dozen years the operation of our government has taken not only all of the money that has been raised by taxes, but our elected servants have run the nation so far into debt that we will either have to struggle desperately to get out within our own lifetimes or pass on a huge debt to our children and our children's children. In other words, pass on to them bills for our own carelessness or brainlessness in selecting legislators who find it easier to hand out money—our money—than to think out a method by which each can earn his own way.

The tax bill for 1938 was approximately $100 for each man, woman, and child in the United States and for one-third of 1939 it will be much larger. And how many escaped paying? Not one, unless he was a beggar. People who think that they do not pay taxes are mistaken. Every person who pays rent, buys food, or goes to a movie pays his taxes. The tax is added to the cost of the merchandise and although the buyer doesn't know it, the tax is there and he pays it.

At the present time about one-fifth of the national income is paid over to the government to meet the tax bill. Out of a total income of 65 billions of dollars, 13 billions have to be paid over to the government to cover the cost of various kinds of projects, to pay farmers for not raising crops, to pay stock raisers for not raising beef and pork, and so on. And the tax is still going up.

A great part of the money that is being collected in the form of taxes is being used for "relief." A brilliant idea, this idea of taking from those who work and giving to those who are idle. Every workman at a lathe, in the assembly line, or pushing a truck pays his share of taxes to feed some idle person. In effect, he is being made to pay for votes for the very legislators who have forced these taxes upon him. If the emergency were temporary, we wouldn't mind, but thousands have been awakened to the ease with which they can live without working and we are likely to find that the temporary emergency is permanent.

It is time for us to begin thinking about electing, as our representatives in our government, men who have brains and ability enough to find the answer to our problem and who will stop this undermining of the very foundations of our national life by continuing to pile up a debt which will be impossible to pay.



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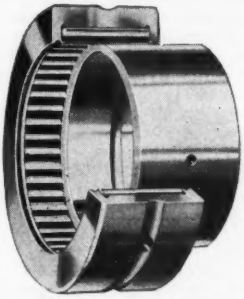

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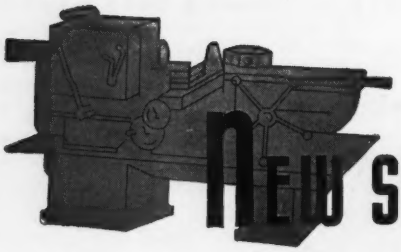


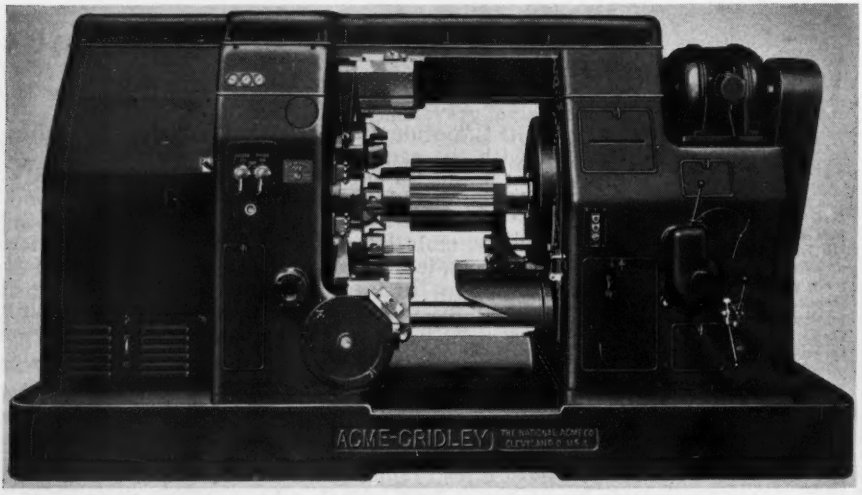
NEW SHOP EQUIPMENT

Acme-Gridley Model RPA 12-In. Six-Spindle Chucking Machine

A six-spindle chucking machine in the 12-in. size, to be known as the Acme-Gridley Model RPA, has been brought out by The National Acme Company, 170 East 131st St., Cleveland, Ohio. The new machine employs the Acme-Gridley principle of mounting the end tool slide around the spindle carrier stem, ensuring positive and permanent alignment of tools with the work spindles.

Spindle speeds and tool feeds are mechanically controlled, while spindle stop and starting and chuck opening and closing are hydraulically controlled. The machine is equipped throughout with high precision adjustable anti-friction bearings. Accuracy is maintained at speeds and feeds as high as modern cutting tools can safely operate. All operating parts of the machine are fully lubricated for free running, long life, and power saving by a lubrication system which insures a constant flood of filtered, clean oil to every moving part of the machine.

The spindle carrier, spindles, and end tool slide are essentially of the design which has been an outstanding characteristic of these machines for years. The total width of the two-spindle carrier bearings in the semi-steel headstock frame is two-thirds the length of the headstock housing. A heavy bearing in the gear box section rigidly supports the stem end, providing a three-point bearing for the carrier system. The spindle carrier housing provides for

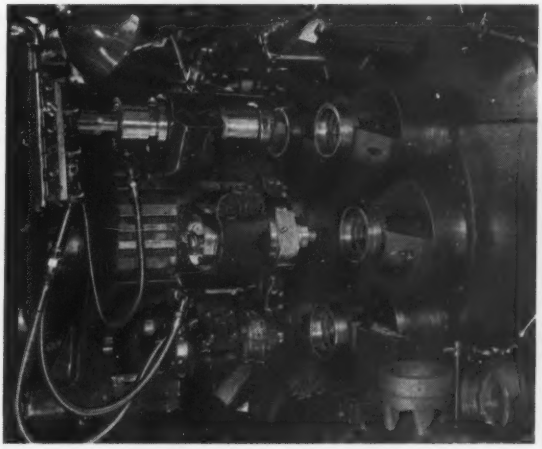


Acme-Gridley Model RPA 12-In. Six-Spindle Chucking Machine

bearing take-up at both ends and when so adjusted after long wear retains its precise alignment.

The spindle holes in the spindle carrier are exactly spaced and concentrically bored. Into these holes are fitted precision ground spindles mounted in anti-friction bearings which are carefully checked for uniformity. All side tool slides are exceptionally wide and long, moving on ways and being provided with adjustable gibs. Each standard slide has an easily adjusted positive stop. The two lower side slides are mounted on heavy bases set at an angle, supported low and well back into the frame without overhang. The two upper side slides are mounted on the heavy top brace. Each slide is independently controlled from its horizontal drum in the top brace, driven through gears and a vertical shaft from the lower cross slide drum shaft at the front of the machine. This especially rigid top slide construction makes practicable the application of heavy tool holders in the two top spindle positions with the insurance of accuracy on wide and deep forming cuts. Provision is also made for mounting two centrally located side slides on the face of the headstock housing, each slide being independently controlled by vertical mounted cam drums located on upright shafts and driven from the lower side drum shaft at the front of the machine.

All gears that operate at high speeds are of the helical type, rough cut, heat treated, and then finish machined to accurate form and size for smooth and quiet running at unusually high speeds. An interchangeable feed change gear and spindle speed change gear system is used, all of the gears being mounted at the motor end of the machine where they are easily accessible.



Close-up view of Acme-Gridley Model RPA 12-In. Six-Spindle Chucking Machine showing typical job in process. The part is heat treated malleable casting 5⅝-in. diameter and weighing 18 pounds. Machining time is 52 seconds.

The nominal O.D. of chuck is 12 in., the maximum swing is 12 in., and the maximum length of turning is 12 inches. Minimum spindle speed is 23 r.p.m. and maximum is 202 r.p.m. Pulley shaft speed, 500 r.p.m. Motor, 40 h.p. Maximum standard cam size for lead of tool slide, 8 and 12 in.; for upper and lower

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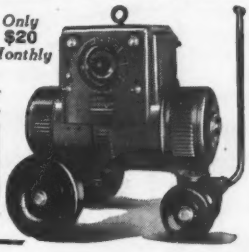

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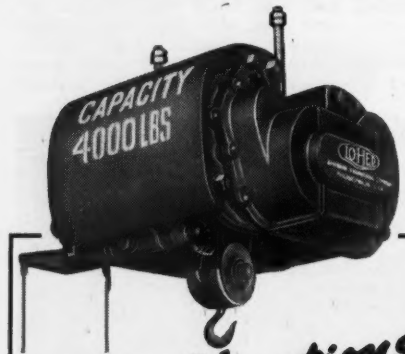

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cross slides, 2 and 4 inches. Floor space required, 6 ft. x 15 ft. Net weight for a motor-drive machine, less motor and tools, 58,000 pounds.

Fellows Straight-Line Gear Generator and Fine-Pitch Gear Shaper

The Fellows Gear Shaper Company, Springfield, Vt., has placed on the market two gear cutting machines particularly suited to the cutting of small, fine-pitch gears. These differ in design, but both are available with magazine for loading of the work.

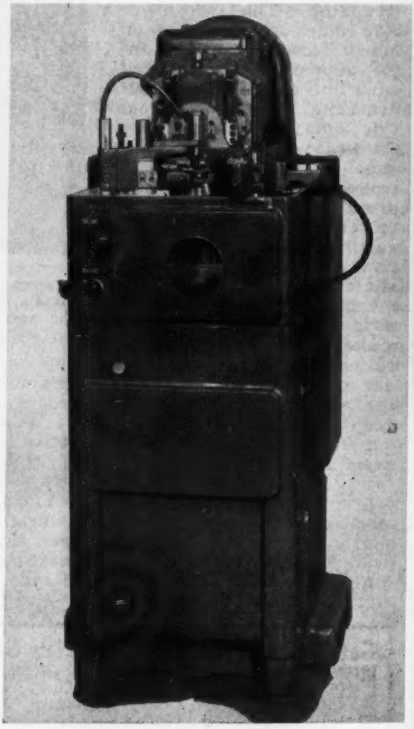

Fig. 1—Fellows Straight-Line Gear Generator for cutting small external, fine-pitch gears using a rack-type cutter.

The Straight-Line Gear Generator,

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shown in Fig. 1, has been designed especially for cutting small external spur and helical gears on a high-production basis and is admirably suited to the requirements of manufacturers of recording instruments, meters, motion picture cameras and projectors, clocks, and so on. The machine is equipped with an automatic means for loading and unloading the work. It differs, however, from the Fine-Pitch Gear Shaper in that it uses a rack-type cutter (Fig. 2) that is carried in a clapper box-type of holder, the latter being mounted on a swivel plate attached to a slide. The slide is reciprocated at speeds as high as 2,000 strokes per minute. The rack holder and swivel plate can be set for cutting both spur and helical gears.

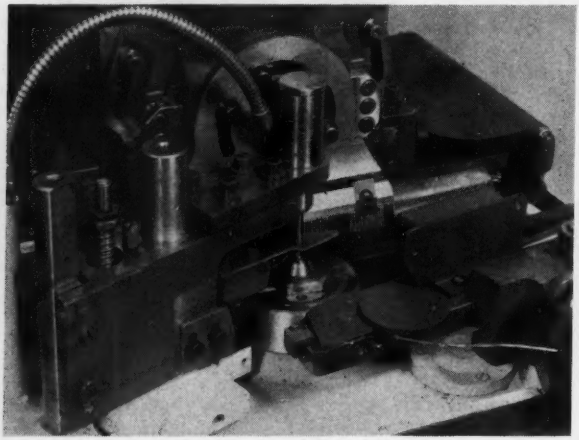

Fig. 2—Close view of rack-type cutter, and automatic magazine, work-holding, and ejecting mechanisms.

The rack cutter is 6⅝ in. long, or approximately the same length as the pitch circumference of a 2-in. gear, which is the maximum capacity. For cutting smaller gears and pinions, the rack cutter is made with groups of teeth separated by gaps. The number of teeth in each group equals the number of teeth on the work to be cut. The bed of the machine carrying the rack holder and slide is traversed by a lead screw. A compensating device is included which, working in combination with the work change gears, effect the required linear travel of the bed to keep the rack cutter in the proper relation to the work. It also affords a means for effecting slight increments in the rate of travel of the rack cutter without altering the change gears, and thus reduces the number of change gears required.

When this machine is equipped with a magazine feed, and is operating automatically, the position of the rack cutter relative to the work is controlled by dogs which operate a reversing mechanism that changes the direction of travel of the bed. These dogs can be set for short travels of the bed, and at any point within the maximum travel of the bed. For instance, in cutting pinions having a small number of teeth —the cutter having several groups of teeth separated by gaps—the machine would be operated as follows:

The dogs would be set to use the first group of teeth at one end of the cut-

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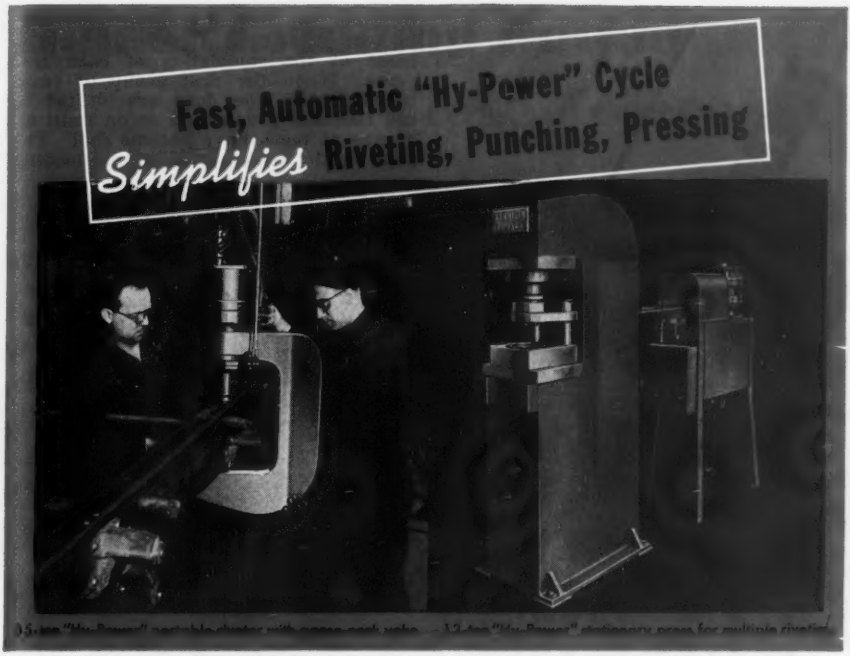

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Hannifin "Hy-Power" hydraulic equipment is available in many portable and stationary types, capacities 7½ to 50 tons, for riveting, punching, pressing, stamping, forming, multiple punching and riveting, and similar operations requiring the application of pressure. Write for Bulletin 42 giving complete specifications.

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ter, and the bed alternately traversed in both directions, a pinion being finished at the completion of each traverse. When the first group of teeth becomes dull, the dogs are shifted to use the next group, and so on until all groups of teeth have become dull. The gaps in the rack cutter permit loading

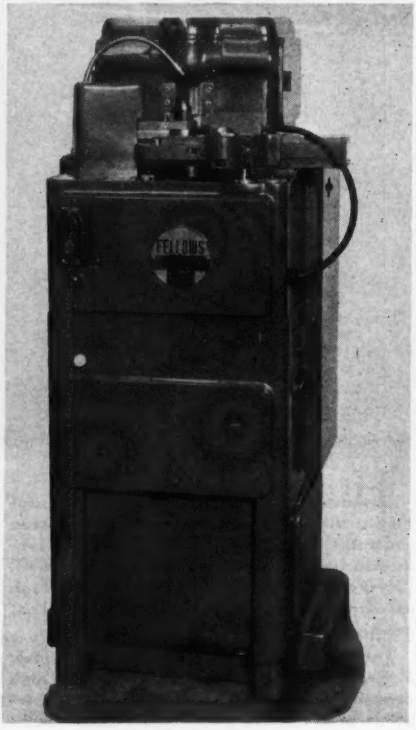

Fig. 3—Fellows Fine-Pitch Gear Shaper for cutting small external and internal fine-pitch gears using disc-type cutter.

and unloading the work without stopping the operation of the machine or withdrawing the cutter from the work. This machine can also be arranged for hand loading in which case a limit switch at the rear of the machine stops the machine at the completion of the gear.

The Fine-Pitch Gear Shaper, shown in Fig. 3, is designed for cutting small fine-pitch gears up to 3-in. pitch diameter, ¾-in. face width. It brings to the

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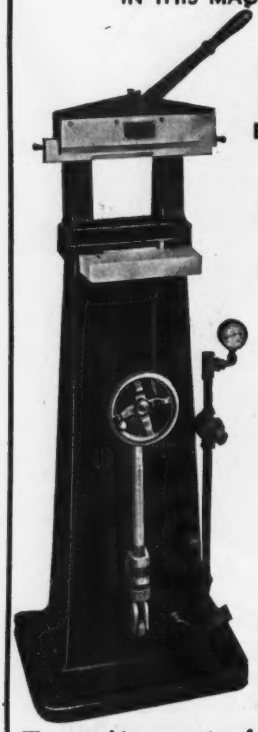

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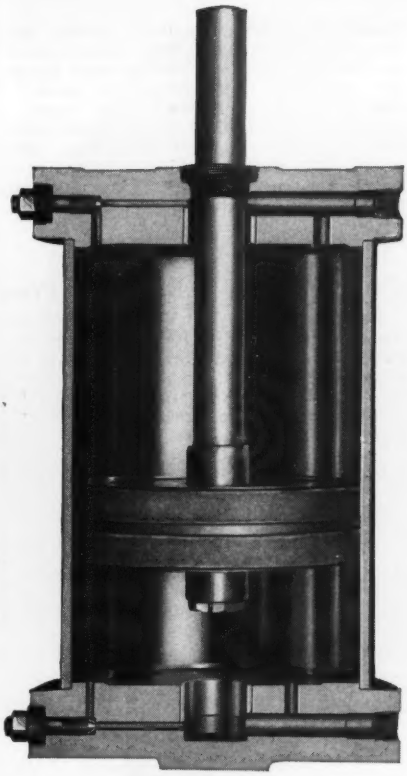
industries using such gears a precision machine admirably adapted to high-production requirements. This machine incorporates several interesting features including effective means for automatic feeding, holding, clamping, driving, and ejecting the work. Another innovation is the use of high cutter reciprocating speeds up to 2,000 strokes per minute.

Chief interest centers around the means employed for loading, holding,

Fig. 4—Close view of magazine, work-holding, and ejecting mechanisms.

clamping, driving and ejecting the work. Fig. 4 shows a close view of the magazine, which is held on a "three-cornered" operating shaft. It is of box section, and is made to suit the shape and character of the work. Other members are a work-feeding slide and transfer finger. When handling thin blanks, as shown in Fig. 5, the blanks are stacked on an auxiliary holder, and the entire assembly fed through the magazine. The lower face of these holders is serrated and these serrations mesh with corresponding serrated sections on the locating and driving adapter on the work spindle.

The work-clamping mechanism, shown in Fig. 4, operates in conjunction with the magazine and carries a ball bearing centering and clamping support. The work support carrying the clamping member is elevated by a cam, which is timed with the cam operating the magazine. This support is acted upon by spring tension which is sufficient to hold the work rigidly in place when the



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More "service" features are described in our catalog No. 36-A. It will assist you in selecting the type of cylinder that will help you **toward your better product.**

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Factory at 620 N. Mechanic Street, Jackson, Michigan. Agents in principal cities. T-J products also include Oil Hydraulic Cylinders . . . Remote Control Systems . . . Rotating Chucks and Cylinders . . . Rivitors . . . Clinchors . . . Special Equipment . . . Brownie Coolant Pumps . . . T-J Die Sinking Milling Cutters.

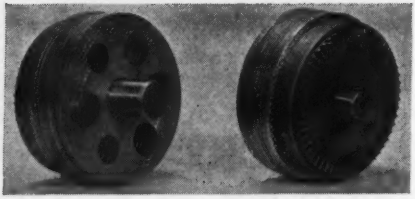


Fig. 5—One type of work holder used on Fine-Pitch Gear Shapers for handling thin blanks.

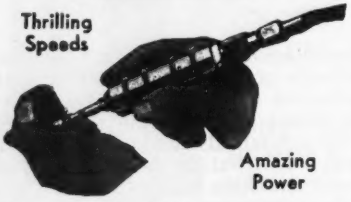
teeth are being cut. At the same time that the work support is raised by one cam, a second cam which is timed with the work-support cam raises a work ejector to remove the work from the work adapter, or work-spindle, as the case may be.

As the work is elevated, another ejector working in conjunction with the work support is released to eject the work from the cutting position. The magazine then swings into position for loading another "assembly"; the support lowers to clamp the work; the magazine withdraws, and the cutter is fed in to depth. The cutter spindle continues reciprocating when loading and unloading is taking place. Single gears are handled in a similar manner except no auxiliary work holder is used. A micro-switch operating a red light at the front of the machine indicates when the magazine requires reloading. This machine is also available, without magazine, for hand loading. The maximum capacity of the magazine is 2-in. diameter.

THE M-B "SUPER-SPEED" PNEUMATIC GRINDER

MODEL S.S.-SR

Thrilling Speeds



Amazing Power

The Original and **ONLY** Portable Air Turbine Grinder with Spindle Speed of 100,000 R.P.M. on 100 lbs. Pressure. Steel Housing **(for SAFETY)**. Weight, 14 oz.

Also other models and air line filters and automatic air line lubricators.

Write for details.

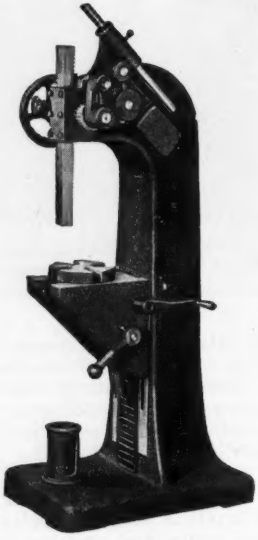
M-B PRODUCTS

130 E. LARNED ST. DETROIT, MICH.

Export Office:
44 Whitehall St., New York, N. Y., U. S. A.

Famco Floor Model Arbor Press

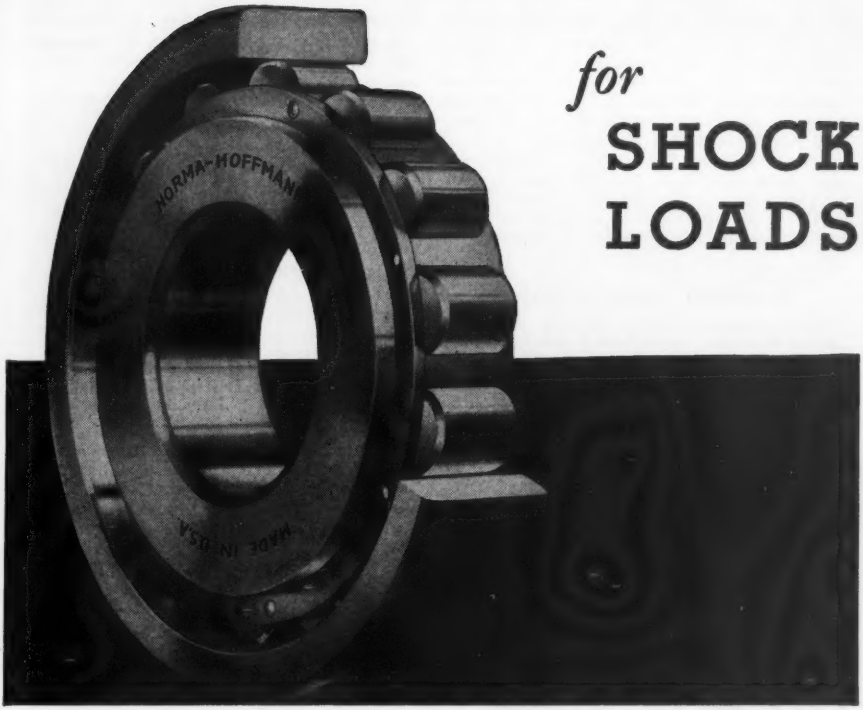
To the line of Famco Arbor Presses made and marketed by the Famco Machine Co., 18th and Holburn Sts., Racine, Wis., has been added the Model No. 5 Floor Type Press shown in the illustration. Leverage is obtained through a combination compound and



Famco Floor Model Arbor Press

simple ratchet leverage press, either leverage being obtained instantly by moving a sliding pin.

The table is adjustable, adjustment being effected by a crank controlled rack and pinion. Maximum capacity when the table is up is 19 in., and the table travel is 11 in., making the maximum capacity over the table when down 30 in. Work up to 21½ in. in diameter



for SHOCK LOADS

ADD shock load and vibration to an extremely severe steady load—and you have a set of conditions that tests the strength and endurance of any bearing. It is under such conditions that NORMA-HOFFMANN PRECISION ROLLER BEARINGS show their superiority.

Equipped with solid cylindrical rollers between cylindrical races, NORMA-HOFFMANN ROLLER BEARINGS provide maximum load contact area—which means correspondingly increased capacity for both steady loads and overloads, together with greater shock resistance than any other type of single-row bearing affords.

Moreover, they employ a heavy-duty, balanced, extruded bronze retainer—riding on the inner ring shoulders and relieving the rollers of its weight—that insures added durability. And their PRECISION qualities make them suitable for low and high speeds alike. . . . Write for the Catalog. Let our engineers work with you.

"NORMA-HOFFMANN"

PRECISION BALL, ROLLER and THRUST BEARINGS

NORMA-HOFFMANN BEARINGS CORP'N., STAMFORD, CONN., U. S. A.

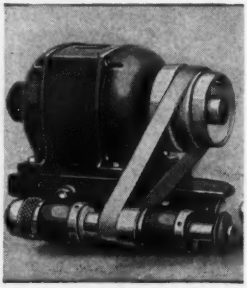
can be handled in the press. The handwheel brings the ram down to the work instantly and the counterweighted arm provides for quick return of the lever upon release. Pressure capacity of the press is given as approximately 12 tons, and the weight is 1,150 pounds.

The semi-steel frame is of rugged design and the ram and pinions are of specially selected steel with heavy stub teeth. The square rack eliminates sideway and provides adequate bearing.

Saroston Lathe Grinder

Illustrated herewith is the Saroston Lathe Grinder, now being marketed by The Saroston Co., 251 N. Park St., Upper Montclair, N. J. The grinder is designed for internal, external, and face grinding on either straight or angular surfaces, also for flat surface grinding on planers, shapers, and milling machines.

The motor base and spindle bearing brackets are cast in a one-piece, reinforced, gray iron casting, eliminating joints and ensuring rigidity. The spindle pulley is located between the spindle bearings, equalizing the load on the bearings and eliminating any tendency to spring the spindle out of line or to set up vibration. The spindle bearings are of the sleeve type; one being of preglazed cast iron, ground to a taper and lapped to a perfect contact with the spindle, the other a tapered, four-slotted phosphor bronze bearing, machined to a perfect fit on the spindle and with an accurate compression adjustment to take up wear. A ball thrust bearing holds the hardened and ground spindle in the correct position. Adjustments are maintained by hardened steel lock nuts. Ample oil reservoir space and oil grooves are provided in the sleeves.



Saroston Lathe Grinder

The grinder is accurately held in position on the machine by means of a sturdy T-slot bolt. Vertical adjustment is obtained by the use of three ground shims, standard equipment with all but the 2 h.p. unit, ⅛ in., $\frac{3}{16}$ in. and ¼ in. in thickness, the same size as the grinder base. A standard make low-speed motor is used with step pulleys providing a choice of three speeds on the fractional horsepower units and two speeds on the 1 and 2 h.p. units.

Each grinder is packed in a substantial container with a hinged cover, latches, and handles. Standard equipment includes extension arbors, spanner and open end wrenches, T-slot bolt

DRILL THESE HOLES

By a Quick, Easy, Inexpensive Method

Your business letterhead will bring literature.

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WILMERDING, PA.

GOING TO MARK IT?

If you're in the market for a stamp that will give you more marks per dollar—try THOR STAMPS.

They're made of correctly-heated alloy steel. Central striking point gives uniform indentation. Thumb side marking makes them easily read—easily used. Write for catalog.

THE PITTSBURGH STAMP CO. • 812 CANAL ST., PITTSBURGH, PA.

CUT MASTER

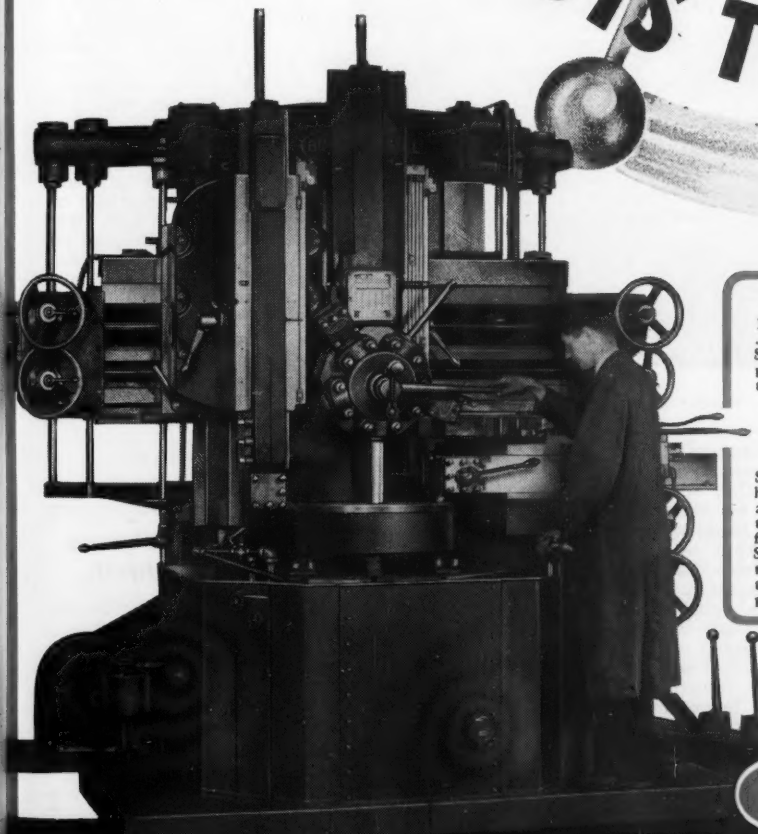
Power Traverse of all main heads

To cut machining time is only part of the machine tool builder's job. The other part is to cut the idle time BETWEEN operations.

That's the reason why Cut Master has 100% rapid power traverse. Both main heads, both their rams, the side head and its ram can be rapidly moved simultaneously according to the need of the moment in any vertical or horizontal direction. Cut Master cuts idle time.

This is only one of the many reasons why Cut Master has been "clocked" on various jobs at one-half to one-sixth the time of ordinary turret lathes. Frankly, Cut Master must be seen to be appreciated. Make arrangements to see these machines in actual operation.

CUTS TIME



Cut Master Cuts Time

16 feeds: .0026" to .500". 20 table speeds. Sufficient speed and power at point of cutting to take full advantage of carbide tools.

Cut Master Accuracy

Screw feeds of rail heads in all directions assure accuracy of thread cutting and fine finish. Heavy Timken Spindle Bearings. Positive pressure lubrication. Inbuilt Accuracy produces Accuracy.

BULLARD

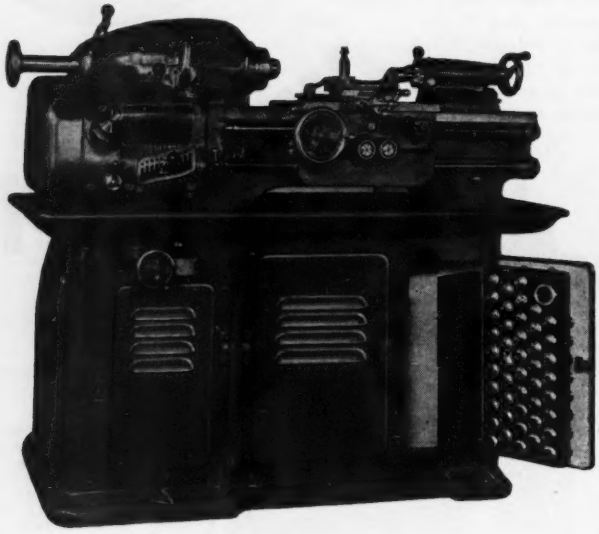
THE BULLARD COMPANY

BRIDGEPORT, CONNECTICUT

and nut, shim, extra belt, diamond holder wheel guard, grinding wheels, and extension cord and switch.

Hendey Tool and Gagemakers' Lathe

A high-speed, sensitive, precision tool and gagemakers' lathe, designed to meet the demand for a precision lathe of heavier construction and greater adaptability than the standard type of bench lathe, has been developed by the Hendey Machine Co., Torrington, Conn. The lathe has a working range of spindle speeds of 40 to 2,000 r.p.m., any speed within this range being obtainable.



Hendey Tool and Gagemakers' Lathe

Speeds of from 500 to 2,000 r.p.m. are obtained through multiple V-belt drive direct to the spindle, no gears being used. The lower range of 40 to 500 r.p.m. is obtained through the use of back gears which are designed with a low pitch line velocity.

The spindle is mounted on super-precision anti-friction bearing at both ends, with the front bearings pre-loaded. Stopping and starting of the spindle are controlled through a multiple disc clutch and foot brake. A size D1-4 cam-lock spindle nose is provided. The hole through the spindle will take 1½-in. diameter bar stock and the spindle collet capacity is 1⅛ in. diameter round stock.

The lathe has two ranges of feeds, one through a belt from the spindle and the other through gearing for thread cutting. Through the gearing the feeds are from 0.002 to 0.120 in. per in. while the belt-driven feeds are from 0.001 to 0.060 in. per in. The quick change gear box gives 66 changes of threads and a like number of feeds for either belt or gear drive. On the index plate the 66 threads range from 2 to 120 per in. without duplication. The pick-off gear sector permits combinations in change gears to any reasonable degree.

The apron is of the conventional type with friction-operated power cross and longitudinal feeds, and with interlock between thread cutting and longitudinal feed to prevent simultaneous engagement. The taper attachment will turn 9 in., at any position on the bed, and has a vernier at each end.

The swing over the ways is 10¼ in., over crossslide is 5½ in. Height of centers above floor, 45¾ in. Net weight, 2,480 lbs.

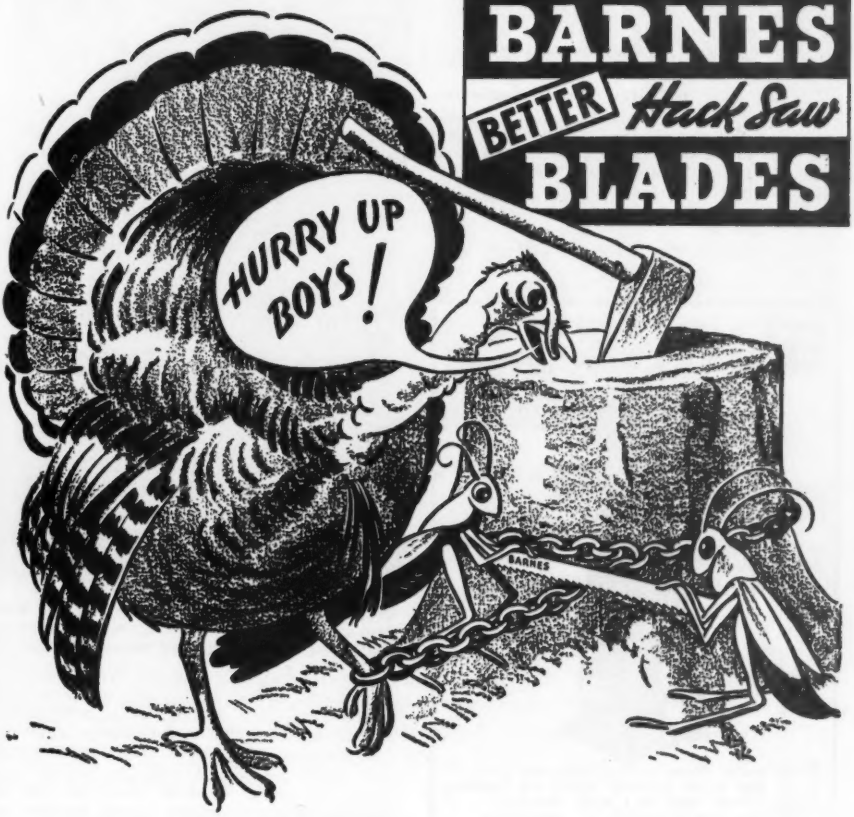
New Electric Furnace Employing Ammogas Allows Foolproof Hardening of Tool Steels

Damage to tool steels by oxidation, decarburization, distortion or cracking during hardening is eliminated through a new refinement of hardening methods, utilizing an electric furnace recently developed by Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.

An Ammogas atmosphere, so inactive with carbon that a soft skin does not form on 1.5 per cent steel soaked in it at 1.850 deg. F. for an hour, is the key to the furnace's success. Its composi-

BARNES

BETTER *Hack Saw* BLADES



In this civilized (?) world of turmoil, it is time to be eternally thankful for friends.

To all of ours -- suppliers, workmen, distributors, field men and our growing host of customers -- to all of you, without whose mark of approval Barnes would never be known as manufacturers of Better Hack Saw Blades, we say: Let us remember that Thanksgiving means something more than a holiday with turkey.

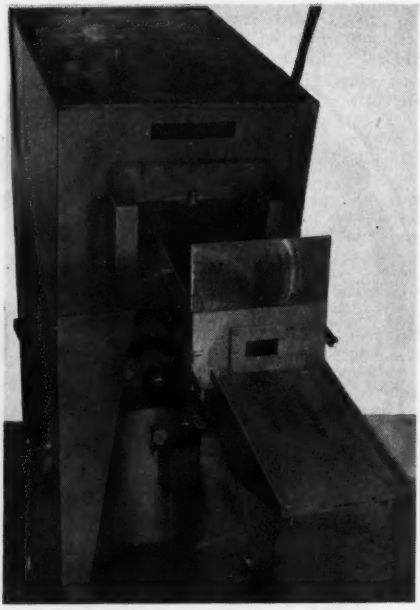
W. O. BARNES CO. INC.

DETROIT MICHIGAN

tion needs no adjustment to the requirements of the steel being hardened, and its strongly reducing character aids in the hardening of stainless steel without tarnish.

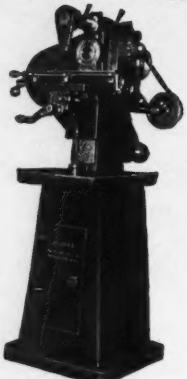
The furnace is tilted at an angle of 20 deg., with the entrance at the low end. As Ammogas is lighter than air, this design prevents contamination of the pure gas atmosphere in the furnace, even with the entrance open. Special radiation shields hold and maintain the uniformity of the heat.

Operation of the oven is simple and foolproof. Pre-heating of work is unnecessary, and cooling is accomplished faster in the gas atmosphere than in air. From one to three hours is required for heat treatment, varying with the type of work, and a tool or die so hardened has a bright, clean surface as hard as the underlying metal. Carburizing power of Ammogas can be controlled without changing the reducing power. The gas doesn't change compo-



Westinghouse Ammogas electric furnace. Note 20-degree angle of furnace, which prevents contamination of lighter-than-air Ammogas.

BURKE Milling Machines



Burke motor driven milling machines, Nos. 1, 2, 3, and 4 are specially suited for handling small, difficult work on a production basis.

Write for complete information.

BURKE MACHINE TOOL CO.

297 E. 16TH ST. CONNEAUT, OHIO

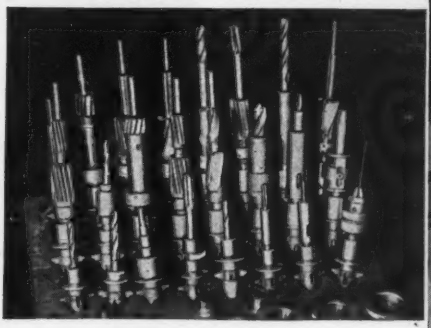
. . . for more than 1001 odd jobs

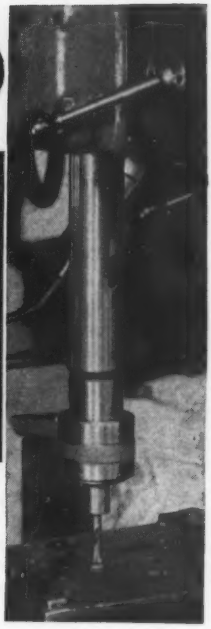
The Hjorth Bench Lathe has the speed, accuracy, handling ease, and dependability that appeals to every operator. That's why you'll find the better shops equipping with the Hjorth Lathe.

Write today for data and prices.

HJORTH LATHE & TOOL CO., 12 BEACON ST., WOBURN, MASS.

All Set to Finish the Job Without Stopping the Spindle





24 Different Operations

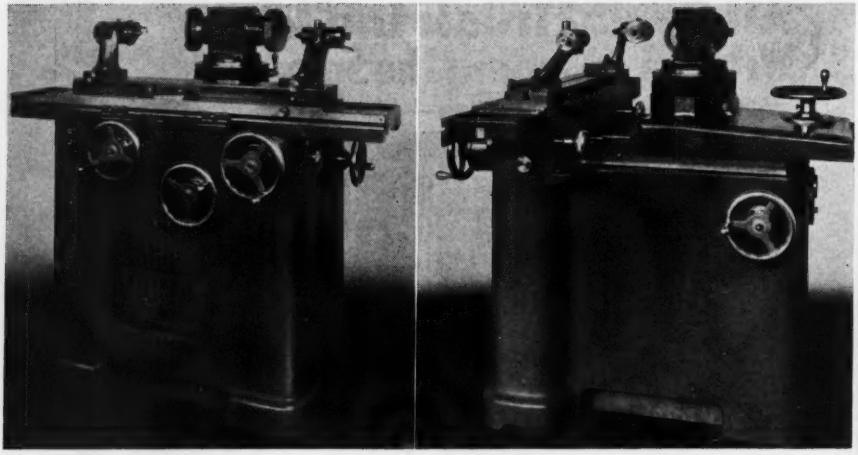
WIZARD Quick-Change Chuck in drill press spindle . . . 24 tools each fitted with its own WIZARD Collet...

Operation range from drilling and tapping 3/8" holes to boring, counter boring and reaming 2 1/2" holes. Thanks to the WIZARD Outfit production is continuous, tools changed without stopping or slowing the spindle. All tapping is done at high speed because taps are protected by WIZARD Friction-Drive Collets. Your production, too, can be accelerated with WIZARDS.

McCROSKY TOOL CORPORATION
MEADVILLE, PA.

WIZARD
QUICK-CHANGE CHUCKS
Keep Spindles Producing

Ask for McCrosky Bulletin No. 15-D



Front and Side Views of Norton No. 2 Cutter and Tool Grinder

sition in the furnace, and its inexpensiveness allows a constant circulation through the furnace to hold out impurities.

Norton No. 2 Cutter and Tool Grinder

An entirely new No. 2 Cutter and Tool Grinder is announced by Norton Company, Worcester, Mass. One of its interesting features is the antifriction table, which runs on balls held in a chain-like container. Since all the balls of a set are selected for size, this feature is important. Hardened steel ways are used and an adjustable braking device permits creating a "drag" on the table or for locking it securely in some specific position—also an important feature, as there are many operations where a free-running table is undesirable.

The cartridge-type ball bearing wheel spindle is driven by a 1 h.p. motor carried on the lower end of a heavy column. A single vee belt from the motor through the column drives the spindle. Graduations on the wheel head enable setting the spindle at any angle in a horizontal plane.

Being a wheelslide-type machine rather than a saddle-type, the distance from the front control handwheels to the work center permits comfortable operation from the front. Furthermore, the work table never overhangs the front of the base and consequently is firmly supported at all times.

Supplementary handwheels at the rear permit operation from either side as well as the front, depending upon the nature of the job at hand and the operator's particular preference. Toe holes at the front and each side of the base permit standing close to the machine with ease.

The machine is available either as a plain cutter grinder or as a universal machine, the only difference being that more equipment is supplied with the universal model. Included as equipment with both models is a universal work head which takes milling cutters having the standard No. 50 (3½ in. per ft.) taper. Supplied with it are reducing collets for No. 12, 10, 9 and 7 B & S and No. 2 Morse tapers. Also supplied is a universal type left-hand footstock which will take No. 9 B & S tapers.

Both the universal work head and the left-hand footstock are provided with clearance angle setting dials. In addition to the plain equipment, the universal model includes attachments for internal, surface, cylindrical and gear cutter grinding. Other attachments are available for hob, form, face mill and long reamer grinding.

The machine weighs between 2,200 and 2,500 lbs., depending on the equipment, and requires a floor space 4 ft. 8 in. by 6 feet.

"JUNIOR" GROWS!

LINCOLN adds 200-AMP SIZE to line of "Shield-Arc Junior" Welders for lower welding costs

Application: Wide range of welding and hard-facing requiring 60 to 250 amperes. Plus-Zone Capacity for extra-light and extra-heavy work.

"Job Selector" and Current Control provide *continuous* selection of both TYPE and INTENSITY of arc for lowest cost on every job.

Non-Inflammable insulation at proper places permits sustained welding with relatively large-sized electrodes for faster welding and lower costs.

Get details today! Consult the nearest Lincoln Office or write

THE LINCOLN ELECTRIC COMPANY

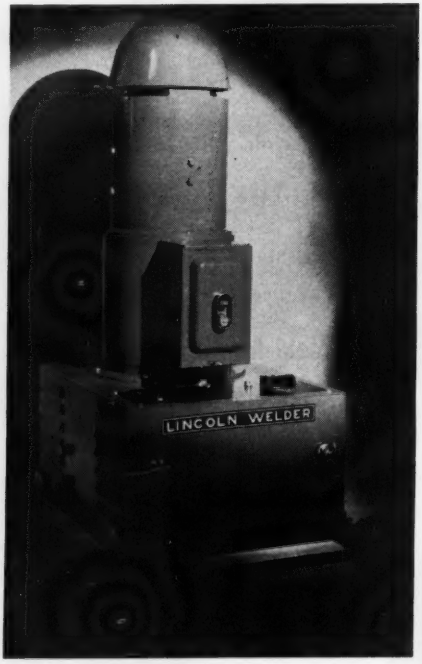
Largest Manufacturers of Arc Welding Equipment in the World

DEPT. E-637 • CLEVELAND, OHIO

Lincoln 200 Ampere Arc Welder

A 200-ampere arc welder of the Lincoln Junior type with a range for many welding applications ordinarily associated with considerably larger welding equipment, is announced by The Lincoln Electric Company, Cleveland, Ohio. The machine, because it is of motor-generator D.C. arc type, is said to weld virtually all metals and alloys and do hard facing work. Its speed of operation and quality of results are reported to be exceptionally high for work of all sizes, under all operating conditions.

The new welder is single-operator, variable-voltage type and can be used with either bare or shielded arc-type electrodes. It has a current range of 60 to 250 amperes for welding duty.



200-ampere Lincoln "Shield Arc Junior" arc welder simplifies welding by its self-indicating dual continuous control.

A special feature, now available for the first time on small arc welding machines, is Lincoln's patented dual continuous control. This advance permits independent adjustment of voltage and current, giving complete and separate control of arc heat and arc penetration, so essential for best and most economical production of sound welds in the many varied present-day arc welding applications. Setting the welder is simplified by the fact that both voltage control and current control are self-indicating.

A further important feature of the new welder is its insulation. Use of Class B insulation at proper points accounts for the ability of the unit to withstand sustained overloads. The Class

KNOCK-OUT Utility Hand Grinder

Ask for bulletin No. H39M.

K. O. LEE & SON CO.
Aberdeen, So. Dak.
"practical tools for practical men"
KNOCK-OUT

BULLETIN:

If increased business activity is prodding your operating schedules to the limit . . . if you are seeking means to boost parts production efficiency without added cost . . . remember that the steel you use and how you use it are vitally important.

In thousands of plants during the past fifty years, Union Cold Drawn Steels have helped achieve the very results you seek. The time to capitalize on their advantages is now!

REPUBLIC STEEL

Your local Union Drawn Distributor carries complete classified bar stocks - - - ready to give you the service you need to maintain operating schedules!

B insulation used in this welder contains no inflammable material whatever. The coils, wound with glass-covered wire, are held in mica-lined slots separated by mica dividers, and the leads are connected into the commutator by special high-melting-point solder. End turns are insulated with mica tape. No cotton, linen, bakelite, or other inflammable materials are used in these parts.

The motor is the "Linc-weld" squirrel-cage induc-type for across-the-line starting. Connections are readily available for either 220 or 440 volts (also supplied for 550 volts or special voltage); 3 or 2 phase; 60 cycles. Construction is arc welded steel. Four steel feet are welded to the base and drilled for bolting in permanent position, or for attaching of 3-wheeled running gear, which is optional. The welder occupies less than four square feet of floor space. A lifting lug facilitates crane handling.

"Steeltest" Hardness Tester

A hardness tester to be known as the "Steeltest" has been introduced by the Modern Collet and Machine Company, 401 Salliotte St., Ecorse, Mich. The instrument is particularly designed for volume hardness testing and is said to offer automatic features never before

"Steeltest" Hardness Tester in Operation

incorporated in equipment of this nature. It can be operated at three speeds and is capable of making 1,200 to 2,700 accurate hardness tests per hour.

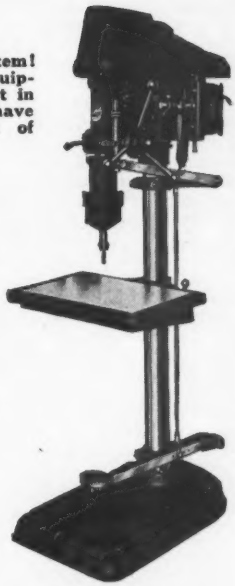
Direct readings on the "Steeltest" give actual hardness numbers in Rockwell and Brinell. There are no charts and no comparative readings. The readings appear on a standard 100-division dial, in all scales, and within the tolerance of standard test bars. The indicating dial is mounted flush with the instrument, out of the feeding danger zone. It has one large black indicator hand and two red tolerance hands which are adjustable to the required limits.

The operation of the "Steeltest" is almost entirely automatic, the only manual operations being the hand elevation, by operation with a removable crank, for the initial setting of one specimen in each batch run and the feeding of the specimens. The travel of the penetrator is fully automatic, and is synchronized with two flasher lights located directly below the indicating dial. One flasher light is green and signals the time to feed. The other light, which is red, shows the setting to be within the range of penetrator

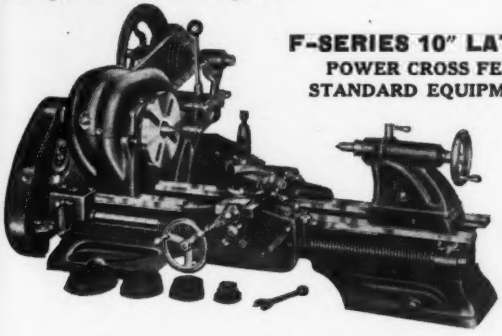
GRANT
Noiseless Spinning Riveters
2 to 6 Spindles
Head rivets from smallest to 3/16" diameter.
Built with automatic trip or foot operation.
Other types include Double-Spindle Horizontal and Single-Spindle Vertical Noiseless Rivet Spinning Machines, and Single-Spindle Vertical Hammer type Riveters.
WRITE FOR FOLDER
The GRANT MFG. & MACHINE Co.
96 Silliman Ave.
BRIDGEPORT, CONN.

YOU'LL SAVE WITH AN Atlas

Here's a "good business" item! —The demand for Atlas equipment has been so great that in the last two years we have added 50,000 square feet of production space.



Save on original cost, save because there are no "extras" to buy before you are ready for operation, save on set-up time, save on production time, save on operating cost. Everything about these modern Atlas machine tools is designed and manufactured to meet the precision and production needs of modern shops. Send for the new 1940 Atlas Catalog for specifications and prices.



F-SERIES 10" LATHES
POWER CROSS FEED
STANDARD EQUIPMENT

Atlas is the only low-priced lathe with power cross feed, complete V-belt drive, precision ground bed ways, custom-built spindle bearings and many other modern features as standard equipment.

SENSITIVE DRILL PRESSES

Floating-drive design, deep-grooved SKF ball bearings, precision-bored quill guides and drive bearing housings give Atlas the "stuff" for long, accurate service on production drilling and tapping jobs.

ATLAS 7" SHAPER

Has all the precision and power of larger machines built down to scale. 4 speeds. 5 surface feeds. A fast dependable shaper for shop or tool room. Send for 1940 Atlas Catalog.

ATLAS PRESS CO. 1146 N. PITCHER ST. Kalamazoo - Michigan

NEW YORK—130 W. 42nd St. CHICAGO—35 E. Wacker at Wabash
PHILADELPHIA—113 N. Third St.

LATHES · DRILL PRESSES · ARBOR PRESSES · SHAPERS

travel. When the instrument is running idle or if the specimen is being tested improperly, the red light will appear and can be noticed from a considerable distance.

The penetrator is encased in a housing which shields it from all possible damage and the nosepiece of the housing is designed with a guard so that the smallest parts may be tested without endangering the fingers.

Dead weight Minor and Major loads are applied automatically and are positively constant, thus overcoming inaccuracies which arise through manual operation. Minor load is 10 KG; interchangeable calibrated weights give Major load of 60, 100, and 150 KG. The compensated loading beam gives a constantly equalized dead weight application through the entire stroke. There is no "pendulum swing" in the load, a most important factor in accurate application of Minor and Major loads. There are no friction burdened pushrods or cumbersome auxiliary lifts in the loading mechanism.

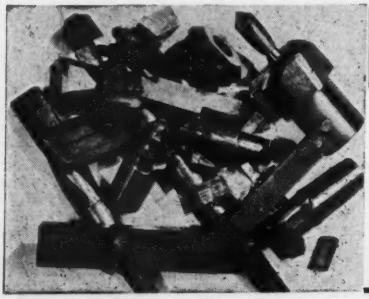
The power supply is a 1/15 h.p. Ratiomotor, 60 cycles, 110 volt A.C., arranged with a direct-coupled cam drive. Speed changeover is readily made with an adjustable "lift" (built in) which gives instant tension adjustment without the use of screwdrivers or wrenches.

U. S. Multiple Belt for Variable Speed Drive Motor

The illustration shows a U. S. Variable Speed Drive Motor mounted on an adjustable base and equipped with a multiple belt which has been developed for use on this motor by U. S. Electrical Motors Inc., Los Angeles, Calif. Speed changes on this unit are effected by a revolving handwheel, thus shifting the motor on the base and moving the yoke which actuates the pulleys. The belt may be tightened or loosened without shifting the entire base. This adjustment is made by turning a set screw which turns the eccentric bushing located at the pivot point of the shifting yoke arm.

U. S. Multiple Belt for Variable Speed Drive Motor

The ways on the motor mounting base and the main unit base are accurately machined, assuring correct alignment, and providing a rigid sliding support for the motor. In order to provide for thorough greasing of the pulley sliding fits, the pulley shaft is hollow partway through so that grease can be ejected through orifices from the hollow section to the sliding surfaces. The end of the motor shaft is also equipped with a grease fitting.



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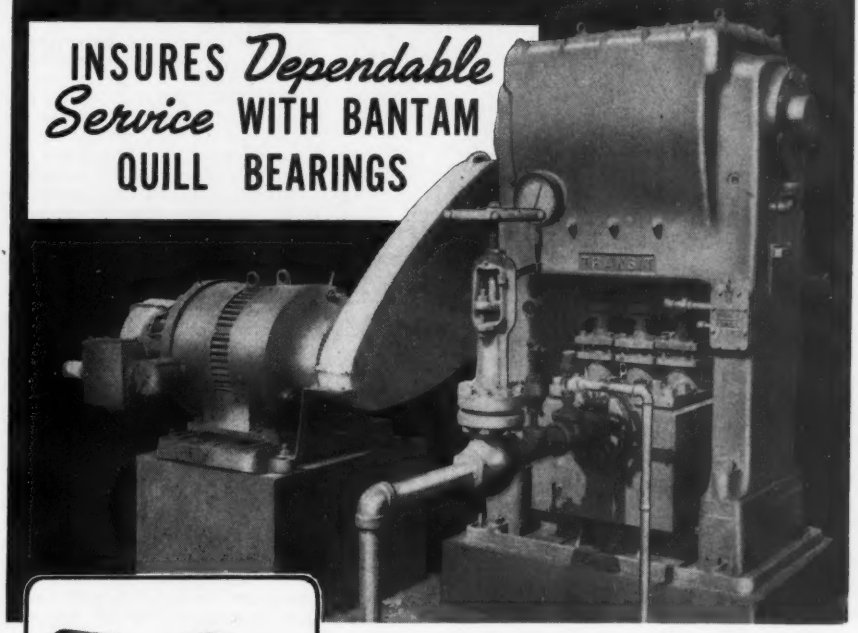

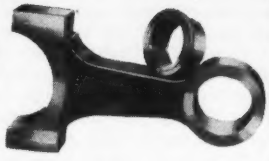

Closeup of connecting rod, crosshead pin and the two Bantam Quill Bearings used in the TRANSIT 6" stroke, Single Acting, Enclosed Vertical Triplex Pump.

● National Transit Pump & Machine Co., Oil City, Pa., have established an enviable reputation for dependable transit pumps. Illustration shows one of their 6" stroke Single Acting Enclosed Vertical Triplex Pumps recently installed at the Pennzoil Refinery. Its maximum speed is 135 RPM of the crankshaft; maximum plunger load, 10,000 lbs.

To insure utmost dependability, BANTAM Quill Bearings are used in the cross head pins. This type of BANTAM Bearing carries heavier loads, takes less space, and is easier to assemble. Its simplified design with all fragile parts eliminated means longer life and lower maintenance costs. It will pay *you* to consult BANTAM.

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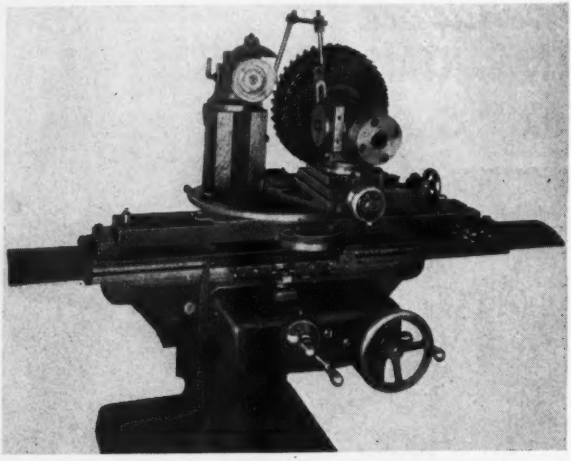
Subsidiary of THE TORRINGTON CO., Torrington, Conn.

TAPERED ROLLER – STRAIGHT ROLLER – BALL
BANTAM
BEARINGS

Covel Large Radius Grinding Attachment

To facilitate the grinding of radii on the corners of milling cutter teeth and for grinding similar radii, Covel Manufacturing Company, Benton Harbor, Mich., has developed the radius grinding attachment shown in use in the illustration. While the attachment is designed primarily to be mounted on the No. 91-A Covel Universal Cutter and Tool Grinder, it can be used on almost any grinder having a flat top table from 5 in. to 6 in. wide with longitudinal movement of a few inches and using a cup grinding wheel approximately 3 in. to 5 in. in diameter.



Covel Large Radius Grinding Attachment set up on Covel No. 91-A Universal Cutter and Tool Grinder

To use this attachment, it is mounted on the grinder table as shown and the face milling cutter to be ground is mounted in the spindle of the top part with the corner of the tooth to be ground aligned with the 90 deg. notch in the guidepost. The guidepost is removed after the cutter is lined up, the corner of the cutter now being on the exact center of the pivot point. The operator then adjusts the two slides to the amount of radius required, being guided by floating dials graduated to 0.001 in. for accurate setting. The spindle is adjusted to provide the proper clearance on the face of the cutter and the lip rest is adjusted either on the top or bottom of the tooth to provide the necessary clearance. Stops limit the swinging motion of the attachment to 90 deg. The base is graduated for accurate reading.

All parts of the attachment are substantially built and well protected from dust. The spindle is mounted on adjustable ball bearings for free and accurate motion. The pivot of the main lower part is mounted on an adjustable tapered roller bearing.

The attachment is intended for grinding face mills from 2 in. to 14 in. in diameter, end mills with ball ends from 5/8 in. to 2 in. in diameter, or concave or convex radius from 0 to 2 in. The spindle has a No. 50 National Standard Milling Machine taper hole in one end and a No. 12 B. & S. taper hole in the opposite end, furnished with collets to reduce either end to No. 10, 9, or 7 B. & S. taper. Combined net weight of the main or bottom part and top face mill grinding attachment is 210 pounds. Standard equipment includes micrometer cross feeds in two directions with stops, center guidepost, grinding wheel dresser, two hold-down bolts, one stop for lower main part to limit swing, one stop for table to limit swing, one set of tool spring holders and spring, and one set of lip rests and holders. The top part, comprising the face mill grinding attachment, is special.

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METAL CUTTER OR NIBBLER

Cuts all metals any shape—
30 gauge up to 1".

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First Practical Metal
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Look over this 14" Metal Cutting Band Saw . . . see what a fine, dependable machine you get for so little money. You'll agree that there's no need for any plant to get along without a light saw . . . no need to pay the high costs of running a big saw on light work.

Eight speeds make this saw useful for many jobs. It will cut metal bars, shapes and sheets or plastic, fibre, etc. In a moment it can be set to drive direct for woodworking.

It is ideal for a general machine shop, toolroom, foundry, experimental and maintenance work, as well as for regular production operations.

Send for Catalog which gives full details about the tilting table mechanism, dust sealed bearings, safety features, etc., etc. Better, see the saw and other Walker-Turner tools at your local Walker-Turner dealers. Walker-Turner Co., Inc., 7119 Berckman St., Plainfield, N. J.

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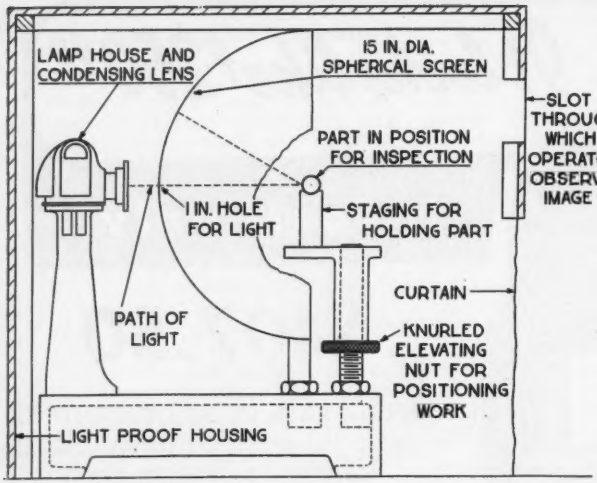
LAMP HOUSE AND CONDENSING LENS
15 IN. DIA. SPHERICAL SCREEN
SLOT THROUGH WHICH OPERATOR OBSERVES IMAGE
PART IN POSITION FOR INSPECTION
1 IN. HOLE FOR LIGHT
STAGING FOR HOLDING PART
CURTAIN
PATH OF LIGHT
KNURLED ELEVATING NUT FOR POSITIONING WORK
LIGHT PROOF HOUSING

Drawing illustrating method of inspecting finished surfaces, using Jones & Lamson Comparator

hemispherical screen, 15 in. at its maximum diameter. Magnification naturally depends upon the size of the work, a ¼ in. ball, for example, being magnified 60 times. The instrument may effectively be used to inspect spheres up to 1½ in. in diameter.

Jones & Lamson Comparator

Jones & Lamson Machine Co., Springfield, Vt., announces a new comparator especially designed for inspecting spherical surfaces such as those of balls used in precision ball bearings. Whereas hitherto the determination of the size and nature of flaws on highly finished surfaces of this type has necessitated the use of expensive instruments and highly skilled operators, the comparator under discussion makes the inspection of these surfaces a very simple yet exact procedure without the necessity for highly skilled operators and with great economy of time.

The method employed in this machine is illustrated in the drawing. An enlarged, true image of the surface under inspection is projected onto a concave

Allis-Chalmers "Weld-o-tron" Electronic Arc Welder

Allis-Chalmers Mfg. Company, Milwaukee, Wis., has brought out a novel design of low-current electronic arc welder for precision work, to be known as the "Weld-o-tron" unit. The unit can be used to weld with currents as low as 5 amperes, using newly developed $\frac{1}{32}$-in. and 3/64-in. electrodes. Steels, stainless steels, and other metals lighter than approximately 18 ga. which hitherto could not be welded satisfactorily without seriously burning the metal and destroying many of its vital properties can now readily be welded. As a result, the equipment is said to be applicable to many types of work previously considered too small or too light

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Companions

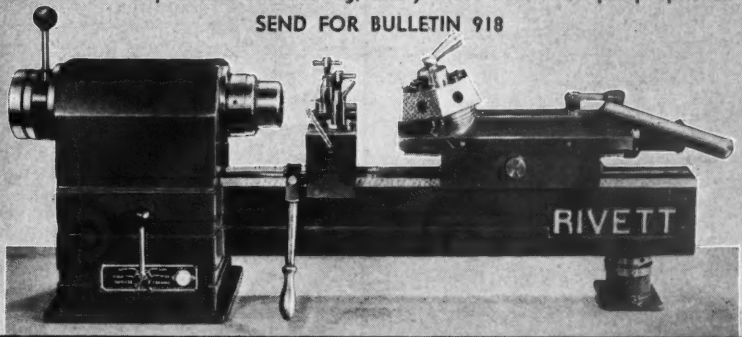
918 BENCH LATHE

Bulletin 918 presents Rivett high precision, heavy duty bench lathe and hand screw machine. The balanced design, vibrationless performance, high spindle speeds and operating features place these machines in front for your precision tool room and production work.

918 HAND SCREW MACHINE

As with the bench lathe the hand screw machine has all-electric V-belt drive, speeds to 3750 r.p.m., 9" swing ball bearing spindle with long taper key-drive nose and draw-in or push-out type 1" capacity collets. For first operation bar work with or without automatic stock feed. For second operations, spring-temper collets and step chucks. Ball bearing, rotary chuck closer. Oil pump optional.

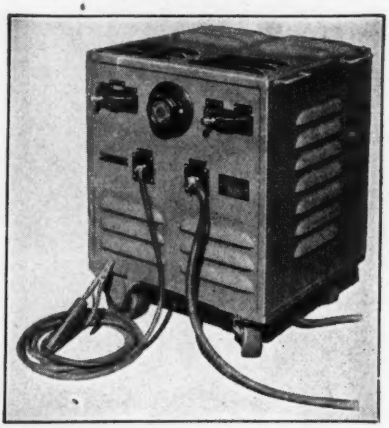
SEND FOR BULLETIN 918



RIVETT LATHE & GRINDER INC.
BRIGHTON, BOSTON, MASS.
PIONEERS IN BENCH LATHE DEVELOPMENT

in construction for anything except riveting, spot welding, brazing or even soldering. It is stated that sheets as thin as 0.010 in. or approximately 32 ga., can be handled without difficulty.

The heart of the Weld-o-tron welder is a multiple tube polyphase mercury vapor rectifier unit which makes use of the newest type of rectifier tubes, specially developed for this equipment. The unit combines light weight, long life, and absence of rotating parts with the advantages of both A.C. and D.C. arc welding. The readily accessible controls and terminals are of the dead front type, and are located on the control panel. Two of them are simple two-way switches; one for current range selection and the other for reversing



Allis-Chalmers "Weld-o-tron" Electronic Arc Welder

polarity of the tube terminals. A hand wheel with easily readable dial provides fine adjustment of the welding current. According to the company, a constant current characteristic has been given to the Weld-o-tron which makes the arc easy to start, easy to hold and which produces the optimum heat conditions at the weld. The same characteristics are obtained from minimum to maximum current settings.

Landis Special Centering Mandrel and Work Holding Fixture

The unusual flexibility of the Landmaco Threading Machine is clearly illustrated by the accompanying photograph which shows a Landmaco Machine equipped with a special holding fixture and a floating centering mandrel for handling the threading of steering pivots for a foreign manufacturer of automobiles.

The Landmaco Threading Machine is manufactured by the Landis Machine Co., Inc., Waynesboro, Pa. The machine illustrated is the standard machine equipped with a 1½-in. Lanco Heat Treated Head. The head, however, is

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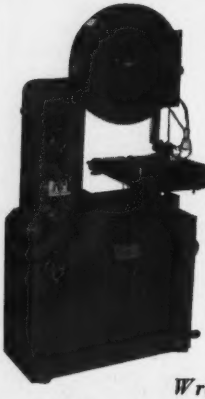

Inside and outside cuts on dies, shoes, templets and endless other jobs can be done in a small fraction of the time required by former methods. Saws, files and polishes. A highly developed, large capacity machine.

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Oliver of Adrian Drill Grinders, Tool and Cutter Grinders, Face Mill Grinders, Tap Grinders, etc., are the most modern, up-to-date and reasonably priced grinding machines available anywhere. They are designed and built to give you easy operation—fast and efficient service — reground tools that will out-perform — tools that will last longer between grinds, eliminate breakage, reduce scrapped parts and cut machine down-time.

* * *

Send for illustrated booklets that will show you the way to more profits thru modern tool reconditioning methods.

Cut illustrates the new 510 Oliver automatic twist drill pointer—for drills ¼ to 3" —Variable point angles— Variable clearances.

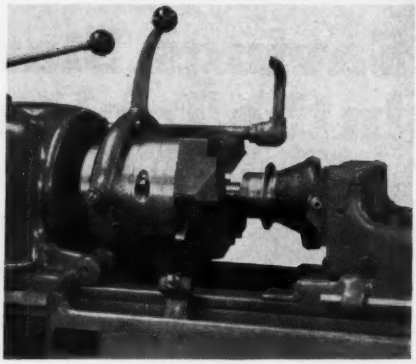
We Also Build Oliver Die Making Machines

OLIVER INSTRUMENT COMPANY
1430 EAST MAUMEE STREET .:. ADRIAN, MICHIGAN

fitted with special oversize chaser holders required to thread the 78 m/m ($3\frac{1}{16}$-in.) diameter of the steering pivot.

A spring-loaded centering mandrel is located within the bore of the die head and of the machine spindle. The end of the mandrel protrudes beyond the face of the die head a sufficient distance to engage the steering pivot before the threading operation commences. The mandrel has a close sliding fit within the bore of the pivot and thus assures concentricity between the bore of the pivot and the thread.

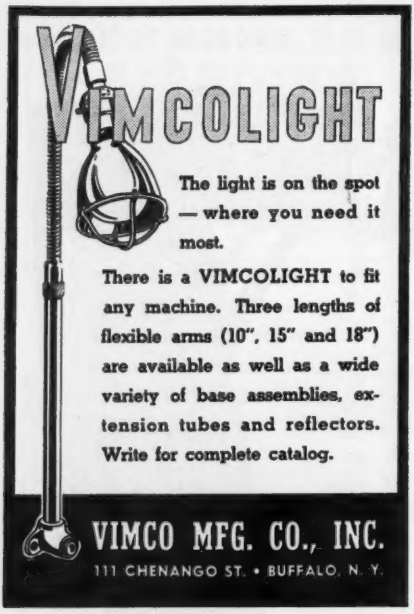
The conventional carriage front on this machine is replaced by a special holding device which supports the steering pivot in proper alignment with the axis of rotation. The shape of the part is such that no clamping device is necessary on the holding fixture; the pivot is merely supported on the centering mandrel and is driven by lugs which engage the turn-buckles. Both horizontal and vertical adjustment is provided for the holding fixture to assure permanent alignment of the work with the threading head.



Landmaco Threading Machine Equipped with Special Holding Fixture for Threading Automobile Steering Pivots

Ward Leonard Vitrohm Resistor

Ward Leonard Electric Co., Mount Vernon, N. Y., announces a Vitrohm Resistor for operation of fluorescent lamps on direct current. These units, mounted in a small perforated metal enclosure, are designed in accordance with the specifications of lamp manu-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The light is on the spot — where you need it most.
There is a VIMCOLIGHT to fit any machine. Three lengths of flexible arms (10", 15" and 18") are available as well as a wide variety of base assemblies, extension tubes and reflectors. Write for complete catalog.
VIMCO MFG. CO., INC.
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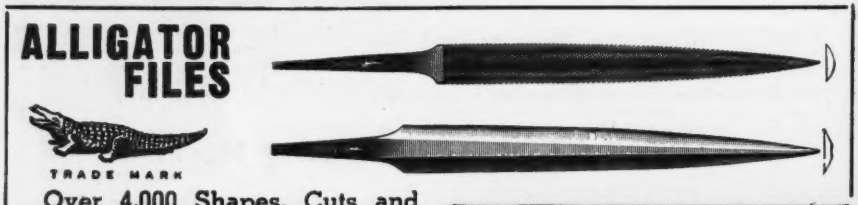

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Style DR, a favored die for production threading on many types of revolving spindle machines. Sizes .056-4 ⅛".

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facturers and are listed by the Underwriters' Laboratories, Inc., and by the New York City Department of Water Supply, Gas and Electricity.

Long flexible leads facilitate connecting the units when mounted in any standard fixture, wiring trough or channel. A plug-in type for portable use is also available for 15 and 20 watt lamps.

Data sheet 1003 lists units for lamps of 15, 20, 30 and 40 watts, also gives dimensions and other information.

"Hardweld 50"

The Lincoln Electric Company, Cleveland, Ohio, has introduced "Hardweld 50," a medium carbon steel electrode designed for the building up of steel parts and surfaces. The deposit has considerable resistance to deformation and wear and is machineable at slow speed. The dipped coating stabilizes the arc and permits the deposition of a tough, dense, medium carbon steel.

In general, when deposited on straight carbon steel and allowed to cool naturally, the hardness of the deposit will be approximately 20-35 Rockwell C. The exact hardness will depend somewhat on the rate of cooling and the analysis of the steel on which it is deposited. The deposit may be hardened by the usual water quench from above approximately 1,500 deg. F., or by flame hardening methods.

An outstanding use of Hardweld 50 is for surfaces which require more resistance to deformation and wear than low carbon steel but must still be machineable, such as shafts, axles, collars, flanges, locomotive and tractor parts, agricultural implements, vise jaws, and so on. It is also used extensively for building worn parts up to size before applying the harder facing alloys.

The procedure is as follows: electrode positive, work negative. Deposit wide or narrow beads as desired. It is good practice to brush each bead with a wire brush before depositing another.

Hardweld 50 can be used for vertical welding but for best results, the work should be fairly horizontal. Where vertical welding is required, start at the bottom and weld up. Hardwell 50 is available in two rod sizes of $\frac{5}{32}$ and $\frac{1}{4}$ in. The current range is 150-225 and 200-350 respectively. Arc volts for both sizes are 20-25.

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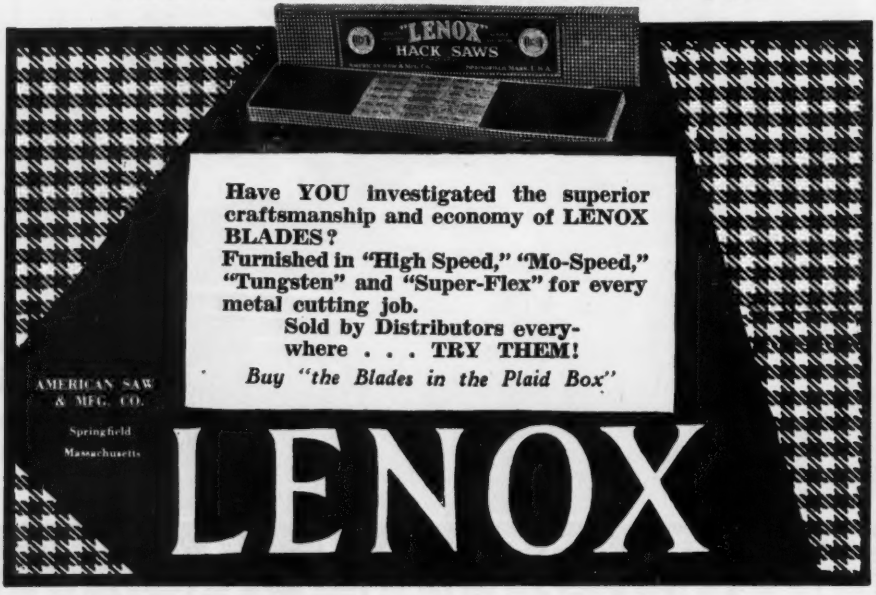
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Furnished in "High Speed," "Mo-Speed," "Tungsten" and "Super-Flex" for every metal cutting job.
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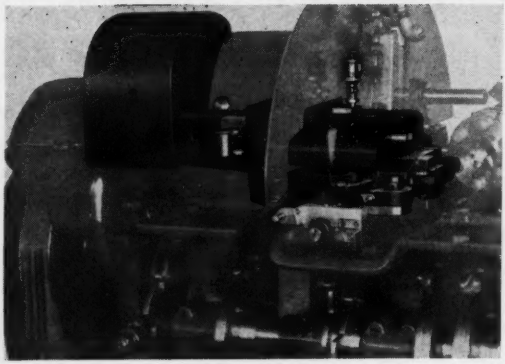
JEWELOX • JEWEL EMERY • JEWEL GARNET INC. JEWELITE • JEWEL FLINT • NEW PROCESS

Brown & Sharpe Thread Chasing Attachment

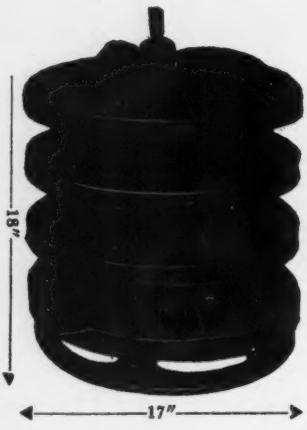
A thread chasing attachment has been developed by Brown & Sharpe Mfg. Co., Providence, R. I., for use on the Brown & Sharpe Nos. 00, 00G, 0, 0G, 2 and 2G High Speed Automatic Screw Machines. Designed to meet the requirements of a wide variety of work, the thread chasing attachment permits the rapid production on B. & S. Automatics of threads of accurate form, lead, and pitch diameter, such as are often required on parts for timing mechanism, electric meter, and similar devices. The attachment is also of advantage in producing threads at back of shoulder.

The attachment shaft is gear-driven from the spindle of the machine, assuring perfect synchronization with spindle rotation. The chasing tool is carried on a double slide assembly mounted on the front cross slide of the machine and the thread is produced by several passes of the tool along the work.



Thread Chasing Attachment applied to a Brown & Sharpe Automatic Screw Machine

For any given set-up, the tool has a fixed path of movement relative to the cross slide, governed by a cam driven from the attachment shaft by a worm and wheel. In operation, the cam advances the tool to cutting position and engages a driving shoe on the tool carrier with the accurately ground threads of a worm or leader on the attachment



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ROTABIN saves you time and space in your machine shop operations. Because of Rotabin's rotating section there is a saving to you of 50% in floor space . . . saves men miles of steps . . . speeds up production and turns unproductive time of men and machines into profits. Let us survey and recommend the proper equipment for your needs. Write today—No cost—No obligation.

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The LeBlond line of Heavy Duty Rapid Production Lathes relieve you of high production costs. You save three ways:

1—Production time reduced by multiple disc brakes and disc clutch which start and stop spindle as fast as you do your own automobile.

2—Production potentials widened by means of back facing attachment and 38 specialized accessories. With a Rapid Production Lathe you can eliminate several other machines.

3—The fine, micrometer accuracy with which the Rapid Production Lathes operate reduces scrap loss.

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11" LeBlond Rapid Production Lathe at one of America's leading auto plants.

THE R. K. LeBLOND MACHINE TOOL COMPANY, Cincinnati, Ohio

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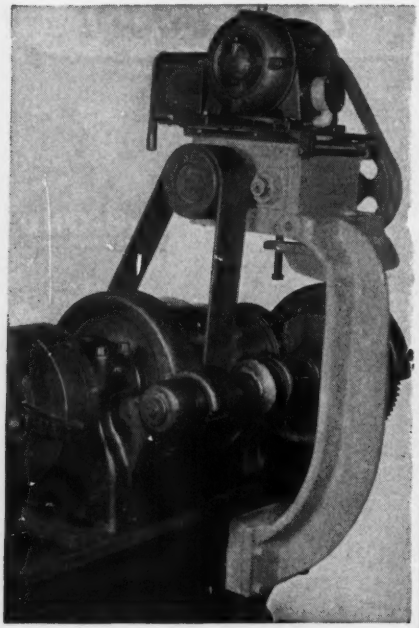

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No one drive meets all requirements advantageously.

Be sure to choose the correct type for your application.

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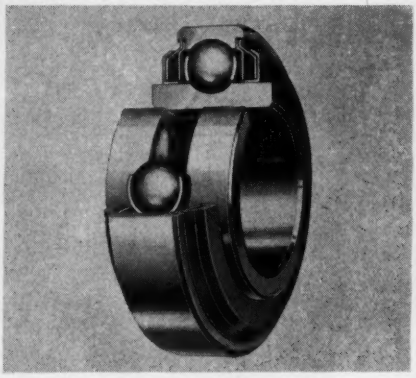
shaft to feed the tool along the work. The tool is withdrawn at the desired point and a spring quickly returns the tool to starting position. The front cross slide cam of the machine steadily advances the machine cross slide while the attachment is operating to feed the tool into the work and positive stops assure accurate depth of cut.

Change gears provide for cutting 13, 14, 16, 18, 20, 24, 28, 32, 36, and 40 threads per inch or 0.5, 0.75, 1.0, 1.5, 2.0, and 2.5 mm. lead. Either right or left hand threads may be cut and the spindle of the machine may be run either forward or backward as required.

Fafnir Bearing Offers Super-Efficient Mechanical Seal

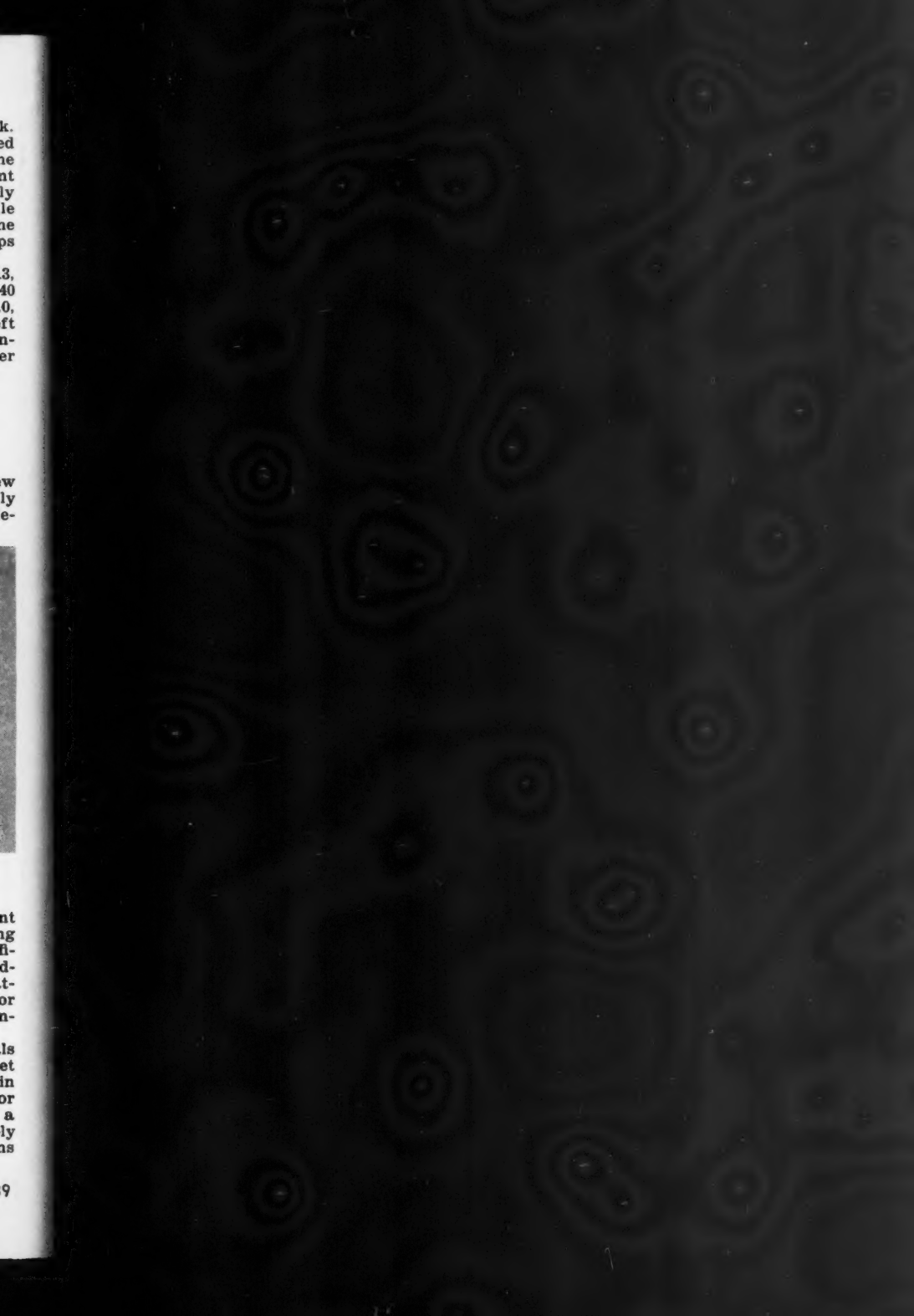
The Fafnir Bearing Company, New Britain, Conn., has made commercially available a seal design known as "Me-

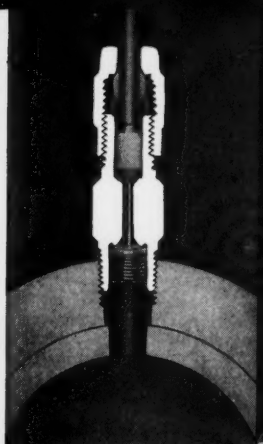


Fafnir "Mechani-Seal" Bearing

chani-Seal." The new development marks a big step forward in bearing closures, for unusually high sealing efficiency is achieved without the disadvantages of any contact material whatsoever. Thus there is no tendency for the seal to generate friction or to increase bearing wear.

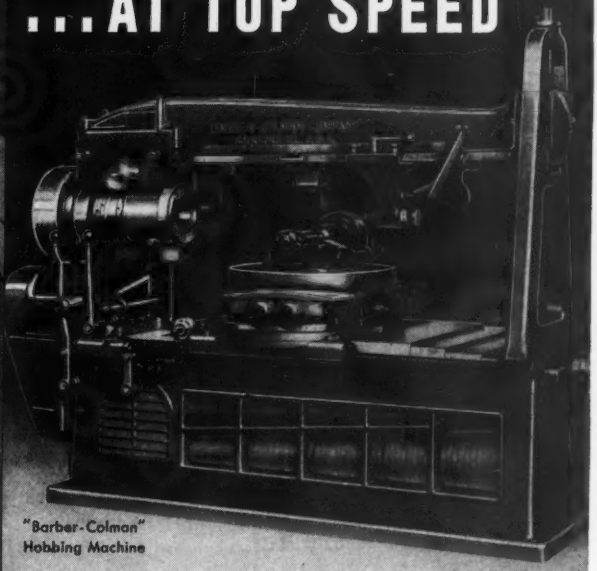
Ball bearings embodying integral seals and shields have been on the market for some time, and have consisted in general of a contact type of seal or else a simple plate acting only as a baffle, which have proved reasonably adequate for the operating conditions





ACCURACY INSURED ...AT TOP SPEED

The correct oil film to each individual bearing... *automatically*



"Barber-Colman" Hobbing Machine

● **A PROLONGED HIGH-SPEED RUN!** Any interruption . . . any shutdown . . . may perhaps mean an entire production schedule shot. Back a few years, you might have had cause to worry. But now, any machine can be equipped with the modern **BIJUR AUTOMATIC LUBRICATING SYSTEM.** Each bearing kept bathed in its correct oil film . . . continuously . . . automatically. With BIJUR installed, your mind is free. Lubrication troubles automatically dismissed!

BIJUR LUBRICATING CORP. . . LONG ISLAND CITY, N. Y.

BIJUR

AUTOMATICALLY *Correct* LUBRICATION

704

normally encountered. The Mechani-Seal Design, however, is an integral part of the bearing itself and provides an efficient closure. It requires only a housing of simple design with a minimum of machining.

The cutaway view of the Mechani-Seal Bearing shows how unusual seal efficiency is achieved without conventional felt seal or other contact material. Two steel plate shields, widely separated to form a trap, serve as the innermost members, both attached to the outer bearing ring. Another steel plate, pressed on the bearing inner ring, acts as a slinger when this inner ring is rotating. Definite though extremely close clearances exist between the individual members so that nothing is added to the total bearing friction. The outer members, in addition, are given a corrosion- and rust-proof treatment.

The Fafnir design is obtainable at present in a number of different variations—Single Seal, Double Seal, Seal and Shield Combinations, on either the Fafnir Radial or Wide Inner Ring bearings. Data sheets and literature are obtainable from The Fafnir Bearing Company, New Britain, Conn., on request.

Stow Junior Flexible Shaft Machine

Addition of a Multi-Speed Flexible Shaft machine to the new Junior line of Stow Manufacturing Co., Inc., Binghamton, N. Y., has been announced. Its applications include grinding, drilling, polishing, wire scratch-brush work and many other similar applications.

The Stow Junior tool is a utility machine which consists of motor with extension cord and plug for any light socket, mounted on a four-caster base which gives it an unusually low center of gravity. It is also equipped with an adjustable arm for regulating belt tension, a three-step cone pulley, a "V"-belt and a flexible shaft with clamp spindle.

The shaft, which is designed on the same principle as that used in the Stow Heavy Duty machines, consists of a rugged over-size flexible core with a tough oil resistant rubber outside casing. The motor end of the shaft is reinforced to insure uniform curvature and is fitted with Oilite bearing. The hand piece is fitted with precision ball

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SAWS MADE IN HIGH SPEED OR CARBON STEEL ¼" TO 10" DIAMETER
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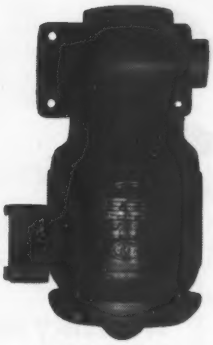
CENTRIFUGAL COOLANT PUMPS AND BY-PASS OIL RELIEF VALVES

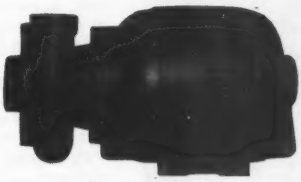
The ideal, efficient units for installation where space is limited.

These compact, quiet units can be depended upon for long life and high efficiency.

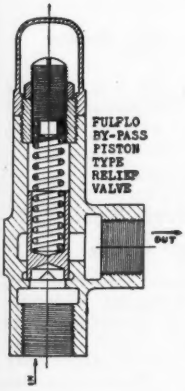
Flexibility in installation is assured through ability to provide for exactly the position of discharge required.



Symbol FVM
Vertical Type



Symbol FHM
Horizontal Type



The Fulflo By-pass Piston Type Oil Relief Valve is made in either cast iron or bronze, with pipe sizes from 1/4" to 1 1/2" and are suitable for pressures up to 350 lbs. They are equipped with either brass, hardened steel, or stainless steel pistons.

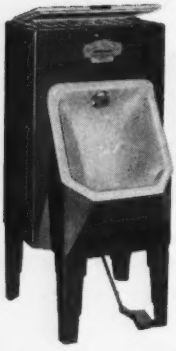
(Complete Information of the "Fulflo" Line Sent Upon Request)

THE FULFLO SPECIALTIES CO., INC.

BLANCHESTER • OHIO

SHOWERWAY

- Saves Time
- Protects Health
- Promotes Employee Efficiency and Good Will



SHOWERWAY provides a new, economical method of sanitary hand washing that can be located convenient to employees' work. Provides hot water in any part of the shop, winter and summer, without piping expense.

Showerway is endorsed by health authorities as an efficient means of reducing the spread of communicable diseases. Factory executives praise its value as a time-saver. Workers are enthusiastic about its comfort and convenience features.

The hands touch only one part of Showerway . . . the soap plunger. There are no drain plugs. Showering action of water keeps the bowl free of unsanitary scum. A thorough sanitary hand wash is completed in 15 seconds. Water heated at low cost by either kerosene or electricity. Showerway is about the size of a small refrigerator, fabricated of metal throughout. Mail coupon for full details.

LYON METAL PRODUCTS INCORPORATED
AURORA, ILLINOIS

LYON METAL PRODUCTS, INCORPORATED
1311 River Street, Aurora, Illinois
Please send full details on SHOWERWAY.

*Name*_____

*Address*_____

*City*_____ *State*_____

bearings with labyrinth oil seal, and has a removable clamp spindle.

This Stow model offers a choice of either ¼ h.p. or ⅓ h.p. motor, and a speed range of from 875 to 3,500 r.p.m. Shaft sizes are ⅜ in. by 5 ft. for the

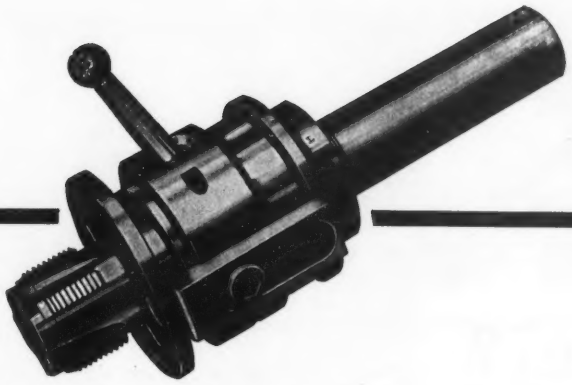
Stow Junior Flexible Shaft Machine

¼ h.p. unit and ½ in. by 6 ft. for the ⅓ h.p. unit, with a maximum wheel capacity of 6 x 1 in. and a drill capacity up to ⅝ inch.

Littell Motor Driven Reels for Light-Gauge Coils

To provide equipment for handling coils of light-gauge material weighing up to 300 lbs., the F. J. Littell Machine Co., 4127 Ravenswood Ave., Chicago, Ill., has announced a line of light-duty motor driven reels and winders for use with automatic punch presses. The reels are provided in four different types, as illustrated: Fig. 1 shows an automatic centering reel; Fig. 2, a plain reel with arms; Fig. 3, a plate type reel, and Fig. 4, a scrap winder.

Among other features, the reels are equipped with adjustable brakes, Mer-



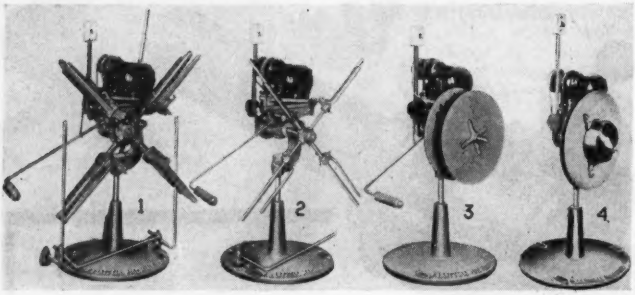
COLLAPSING TAPS

FOR internal threading the Geometric Class S Tap saves money, time and trouble — and produces better threads. Solid, sturdy chasers, rigidly supported in the body of the tool, withstand heavy strains; yet ample chip space insures smooth cutting. With the positive trip, the tap cannot jam nor fail to open. The fine workmanship of a precision-built tool brings clean, accurate screw threads. Shall we send you a catalog?

GEOMETRIC

TOOL COMPANY

NEW HAVEN, CONN.



Littell Motor Driven Reels for Light-Gauge Coils

feeds. The Littell 3G Type Motor Driven Reels, illustrated here, provide a loose loop of material for the feeding equipment.

coid Loop Controls, and are driven by ¼ h.p. geared head motors through V-belt drives. Reels can be used for unreeling stock from right to left or left to right by merely switching the loop control arm from one side to the other. Reels can be tilted to any angle and are adjustable in height. They are fully equipped with anti-friction bearings.

Motor driven reels are said to solve the problem of unreeling coiled stock into high-speed automatic punch press

C-P Super Safety Balancer

To aid in the manipulation of portable equipment where such equipment is so heavy as to cause undue fatigue or where it is necessary to suspend the equipment overhead between operations, Chicago Pneumatic Tool Company, 6 E. 44th St., New York, N. Y., has brought out the Super Safety Balancer illustrated herewith. The balancer is intended for lifting, suspending, or balancing portable tools or objects weighing up to 200 pounds.

Tension is applied by a spring which can quickly be adjusted for any load

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Over

45,000 SPROCKETS IN STOCK FOR YOUR IMMEDIATE NEEDS.

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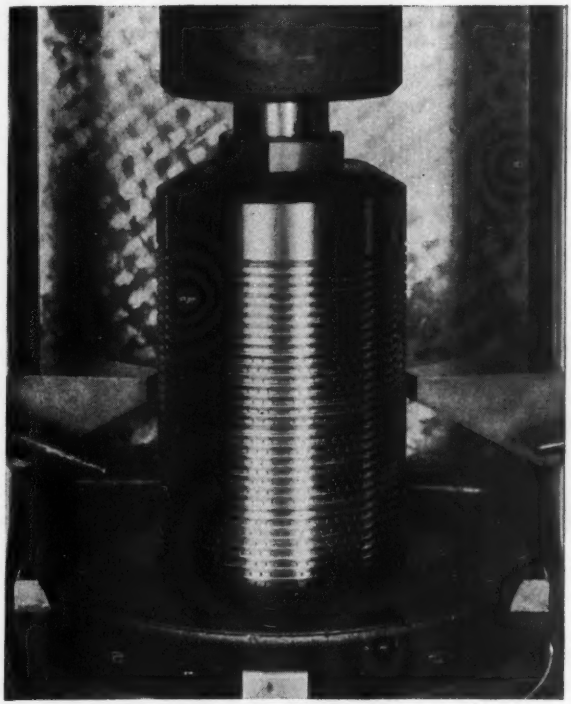
1336 Altgeld St., Chicago



Starting a Part off *Right!*

OCCASIONALLY you will still run across the misconception that broaching is economical only in large-scale production. True, in mass production broaching is cheaper and faster than other machining methods.

But even if speed is not a factor, broaching still retains its primary advantage: *consistently maintained accuracy.*

Compare the example above—broaching the I.D. of big steel tractor ring gears—with, say, doing the same job with a single-point boring tool. The broach (built up of rings 5½ inches in diameter) may cost more initially but it saves money in the end. *It stays put.*

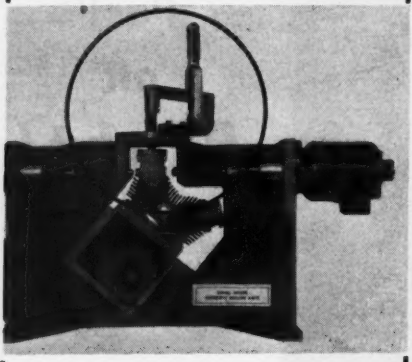
Broaching starts the part off right and cuts rejections later.

There is a Colonial Broach Representative in your territory to help you.

COLONIAL BROACH COMPANY

147 Joseph Campau Street **Detroit, Michigan**

KNU-SINE TOGGLE CLAMPS



Application shows type BFB used on special drill fixture.

• These toggle clamps are sold throughout the entire world, being used by well known companies such as Packard Motor, International Harvester, Chrysler, Murray Corp., Lockheed, Willys-Overland-Vauxhall of England — Bloch, Farman, Citroen, of France—G. M. Holden of Australia, etc., etc. Designed and developed by the originator of toggle clamps for commercial applications, Frank L. McKenna.

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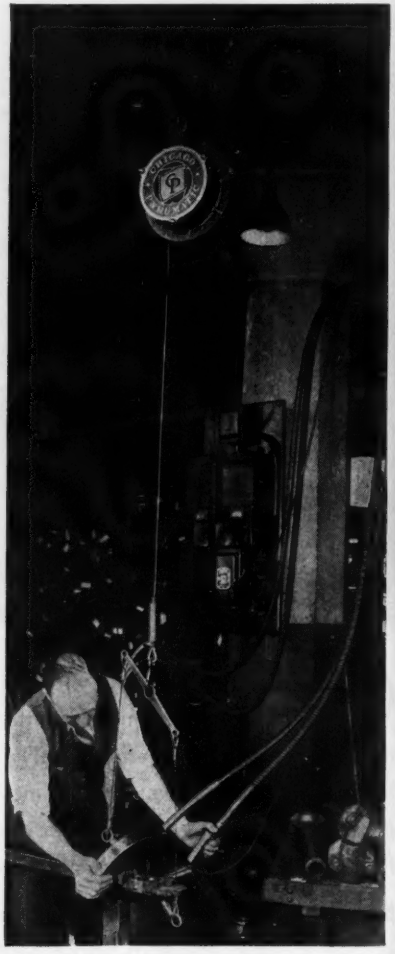
KNU-VISE-INC
2893 West Grand Blvd.
DETROIT MICH.

within the range indicated, through hardened worm gear and pinion. The spring is of unusually large diameter,



C-P Super Safety Balancer

lessening friction between coils and ensuring long life and smooth balancing. An automatic safety lock provides against dropping the load in case of spring breakage—which is said to be a remote possibility. The stop and safety latch are of tough, drop forged steel, cushioned against rubber.

SAVE TIME ON PRECISION WORK

ARC-WELDED
All-Steel Frame

Optional equipment. Absolutely rigid—has strength of one-piece construction. Provided with 32 lock leveling screws which enable user to level plate quickly and accurately. Screws can be locked securely.

CHALLENGE
Semi-Steel LAYOUT SURFACE PLATES

● **Wherever a true, rigid, smooth surface is required for assembly and inspection, Challenge Semi-Steel Layout Surface Plates are highly recommended. They are made of the finest grade iron and steel and planed perfectly smooth and square. Their use in many leading industrial plants has accounted for pronounced savings in time. Challenge Layout Surface Plates are furnished in one standard size, 48x96 inches, with or without steel stand; special sizes on order. Mail coupon for free catalog and price list today!** 361

THE CHALLENGE MACHINERY CO. ✣ GRAND HAVEN, MICH.

CHICAGO, 17-19 E. Hubbard St. Challenge 200 Hudson Street, NEW YORK

FREE CATALOG—**Illustrates and describes Challenge Time- and Labor-Saving Devices for Tool and Machine Industries.**

Name_____

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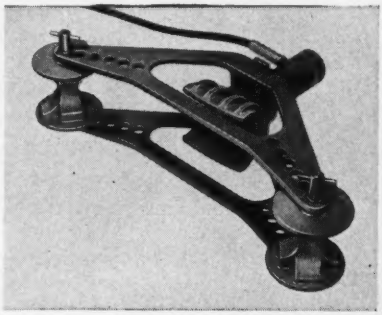
The drum lock holds the load at any point and a cable is said to have a safety factor of 10 to 1. The automatic cable lock prevents overwinding of the cable in either direction. A cable guide prevents the cable from jumping out of the drum groove.

Model S-36 "Porto-Power" Pipe Bender

A "Porto-Power" Pipe Bender designed to handle seven sizes of rigid conduit and pipe is announced by Blackhawk Manufacturing Co., Milwaukee, Wis. The bender is powered by a 20-ton hydraulic unit and is designed to bend pipe of sizes including 1¼, 1½, 2, 2½, 3, 3½, and 4-in. diameters.

The Model S-36 is a 190-lb. unit and has a simplified one-piece bending ram which eliminates 13 various extension bars, tension arms, studs, and so on, which were used in the original Porto-Power Bender. The "pull pin" method of fastening the rotating pivot shoes, which makes wrenches unnecessary in assembly, is claimed to have time-saving advantages. The pivot shoes provide increased portability, having wide rims which act as wheels for rolling the unit on smooth surfaces. The hydraulic unit can quickly be removed from the bending frame and used with special attachments for pulling gears and pulleys or for lifting over long spans at any angle.



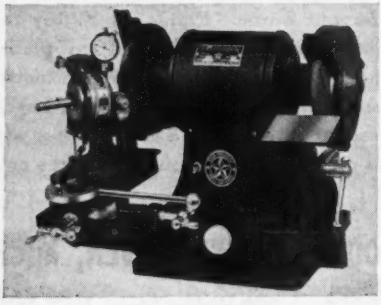
Model S-36 Porto-Power Pipe Bender. Pivot shoes on the frame of the Porto-Power Pipe Bender serve as wheels for rolling the bender along the floor.

Another Blackhawk development is

TRIM YOUR DRILL COSTS

with a

STAR PRECISION DRILL GRINDER



Produces perfect points on drills No. 41 to 5/8" inc.

Write for Descriptive Folder.

STAR MACHINE & ENGINEERING CORP.

Division STAR ELECTRIC MOTOR CO., Bloomfield, N. J.

BATH TAPS

last longer

- - - because

THEY'RE GROUND FROM THE SOLID AFTER HARDENING

BATH TAPS will take repeated re-sharpenings because they're ground from the solid *after* hardening. Their metal structure is correct and uniform from core to cutting edge. This permits regrind after regrind without loss of efficiency.

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OVER 2,500 DIFFERENT SIZES, SHAPES AND CUTS

There is an American Swiss file to fit the most intricate piece of filing. These files are made as closely to size as humanly possible. Special heat treating insures uniform hardness, large factory stocks maintained to assure prompt service at all times.

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ONLY THE BEST ARE GOOD ENOUGH — FILES TOOLS — TRADE MARK

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American Swiss File & Tool Co.

ELIZABETH, NEW JERSEY

the S-30A Pipe Bender which uses a 10-ton Porto-Power Hydraulic Unit. This model is similar in principle and design to the S-36 but handles pipe in the range of 1, 1¼, 1½, and 2-in. diameters. Both the S-36 and S-30A are packed in portable kits for carrying directly to the jobs.

Simplex "Production" and "Welders" Vises

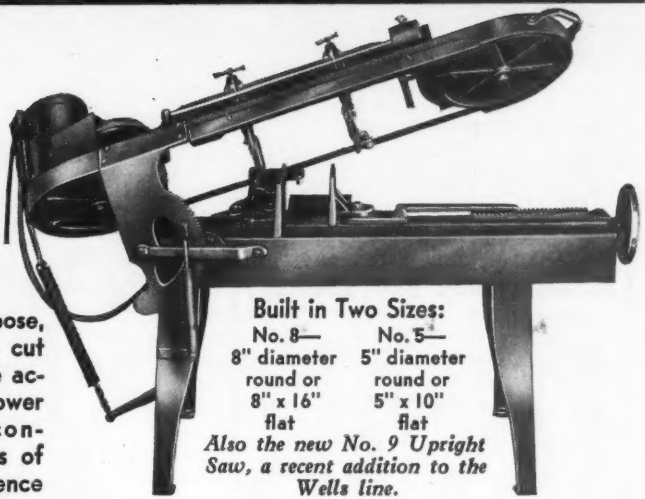
Desmond-Stephan Mfg. Co., Urbana, Ohio, has brought out two new vises, one especially designed to save time on

Simplex "Welders" Vise

production filing, fitting, or assembly work, and the other especially designed for use in welding.

The Simplex Production Vise is designed with a cam in the slide controlled by a handle as shown. Moving the handle to its limit controls the movement of the vise jaws within ¼ in.

Cut time waste with a WELLS SAW



Built in Two Sizes:

No. 8—	No. 5—
8" diameter round or 8" x 16" flat	5" diameter round or 5" x 10" flat

Also the new No. 9 Upright Saw, a recent addition to the Wells line.

WELLS SAWS will cut minutes from every sawing hour in your plant. Adaptable to almost every plant purpose, they are built to cut metals faster, more accurately, and at lower cost. Ruggedly constructed with years of sawbuilding experience behind each machine, Wells Saws will save you time and money. Sold through leading Mill Supply dealers — or write directly to us.

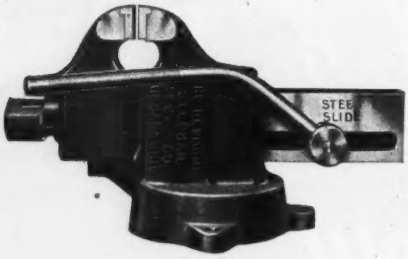
Write for list of users

WELLS MFG. CORP.

WELLS METAL CUTTING BAND SAWS

THREE RIVERS, MICH.

To set the handle, the knurled knob on the movable jaw is revolved, opening or closing the jaw until the opening is ¼ in. wider than the thickness of the



Simplex "Production" Vise

workpiece. When the work is inserted, the handle is pressed down, closing the jaws firmly against the workpiece. Raising the handle instantly releases the work. The Production Vise is made in either stationary or swivel base design with jaw width of 3¾ to 4¾ in., and jaw opening of 3½ to 5½ inches.

The Simplex Welders Vise is designed with a double swivel which enables the work to be held in the best position for welding. The vise can be tipped and swung to obtain any angle or position desired. The vise is supplied with jaws 3¾ to 4¾ in. wide, to open 5, 6, or 7 inches.

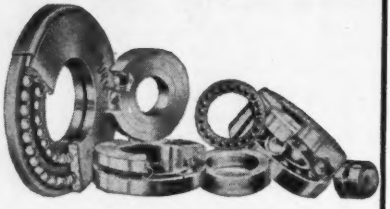
U.S. Model 10WG Combination Wet and Dry Grinder

The United States Electrical Tool Co., Cincinnati, Ohio, has announced a heavy duty combination wet and dry grinder, to be known as the Model 10WG. The tool is designed for heavy duty continuous production. The hood on the wet side has splash bowl with water reservoir and settling chamber, centrifugal pump, valve and adjustable nozzle. The pump is so designed that bearings are not under water. The V-belt has automatic take-up, eliminating belt adjustment. Splash bowl and reservoir are of one piece.

U. S. Model 10WG Combination Wet and Dry Grinder

The dry wheel guard is adjustable to wheel wear and has exhaust connection, hinged door for wheel replacement, and adjustable laminated glass eye shield. The heavy spindle is of chrome-manganese steel, supported by heavy duty ball bearings enclosed in dust-proof housings. The spindle lock is provided for changing wheels. Tool rests are adjustable. The motor control is push button

AUBURN SPECIAL BALL BEARINGS



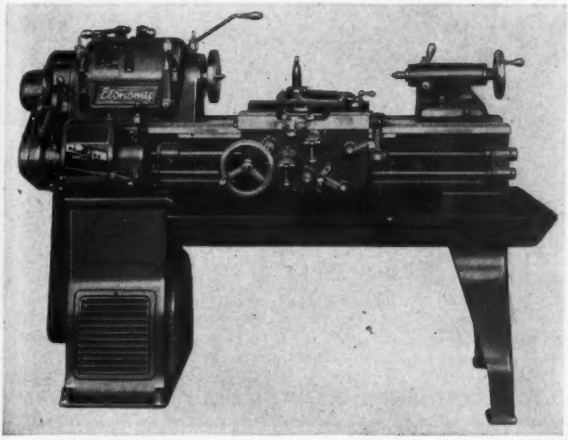
MADE TO ORDER

Auburn Special Ball Bearings are made to customer's dimensions or to answer specified service conditions. Send details of your problem and get the Auburn Answer.

Write for Catalog.

AUBURN BALL BEARING CO.
69 CLARISSA ST., ROCHESTER, N. Y.

Commercial Shops...Schools Save with *Economy* Lathes



High Quality Big Value

ACCURACY
POWER
STAMINA
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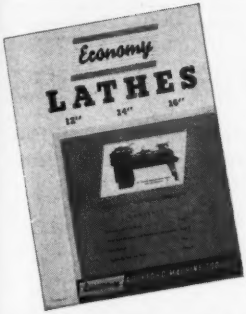


Write, Today, for Bulletin 393

Investigate money-saving *Economy* Lathes. Bulletin No. 393 gives full description of these big-value tools. Ask about low prices.

Built in large lots for lowest production cost, *Economy* Lathes represent unusual high quality and value to the purchaser. *Economy* Lathes provide accuracy, stamina, power and operating convenience for all ordinary commercial manufacturing, maintenance and toolroom work . . . modern features and safety for manual arts, apprentice and engineering schools. They are made in Geared Head and Cone Head types, in 12", 14" and 16" sizes. Geared Head has twelve quick-change spindle speeds; Timken precision bearings. Both types have independent feed shaft and lead screw with interlocking safety clutch; double-wall apron; thread-cutting dial; and other advantages, with fine workmanship and materials throughout. Buy *Economy* Lathes and get big value.

Economy Lathes are made by the manufacturers of *Hy-Draulic* Shapers, Shaper-Planers, Planers and Slotters noted for speed, accuracy, fine work, operating efficiency. Information on request.

Economy LATHES

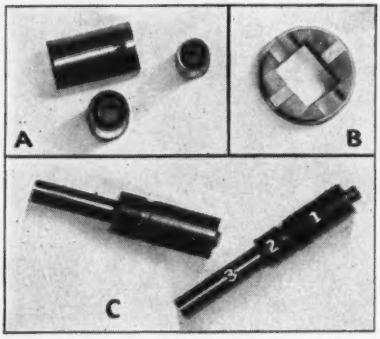
ROCKFORD MACHINE TOOL CO.
ROCKFORD, ILLINOIS, U. S. A.

with overload and low voltage protection. The motor is 3 h.p., capable of heavy duty service, built to N.E.M.A. standards and rated for continuous service at full lead with a temperature rise of 40 deg. The entire grinder is built in accordance with the Safety Code of the American Engineering Standards Committee.

Kennametal Parts

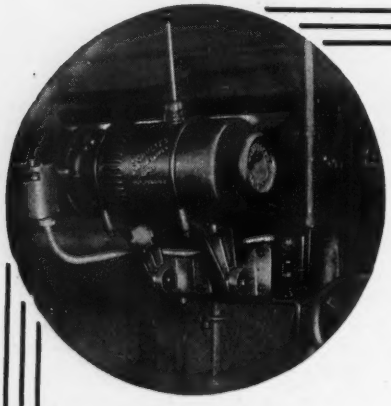
McKenna Metals Co., 300 Lloyd Ave., Latrobe, Pa., announces that Kennametal is now available in almost any desired shape for use in parts subject to unusual wear or for gages which must hold their accuracy. Kennametal is an alloy containing the intermetallic compound, tungsten-titanium carbide.

Shown in the illustration are a few of the many wear-resisting parts now being made of Kennametal. Figure A illustrates three sizes of extrusion dies for coating steel welding rods with abrasive flux. In a recent test, a Kennametal die extruded more than three times as many pounds of electrodes as the best die previously used, with the same amount of wear. Figure B is a Kennametal die for pressing articles of refractory aluminous oxide, used in the radio industry. The wear-resisting properties of Kennametal are said to make it ideal for dies used in pressing and forming abrasive ceramic parts.



Kennametal Parts

Figure C shows progressive-type plug gages for measuring steel bores, such



A No. 2 B & S Milling Machine equipped with Schultes 4 Speed Drive.

4 SPEEDS FOR ANY JOB

on Milling Machines, Shapers, Lathes, Drill Presses, Planers, Punch Presses, Slotters, etc.

The SCHULTES 4-Speed Drive operates each tool at the best speed for the job . . . with finger-tip control.

Schultes-equipped machines are independent units that can be located at the most advantageous points on production lines.

All moving parts enclosed . . . no belts to change by hand . . . fast . . . flexible . . . economical.

Write for further details.

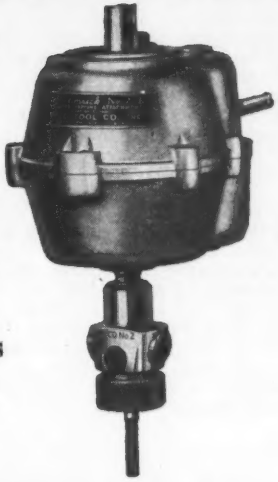
WESTLOF TOOL & DIE CO. 430 Bellevue Ave. Detroit, Michigan

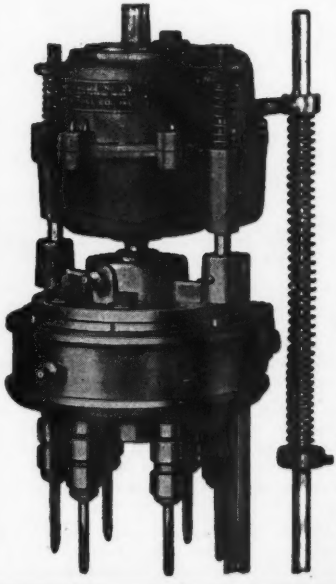
Ettco - Emrick

TAPPING ATTACHMENTS

THE EXACTING REQUIREMENTS OF TAPPING IS UP TO THE FRICTION CLUTCH.

ETTCO PIONEERED SENSITIVE TAPPING WITH A LEATHER LINED FRICTION CLUTCH. AS YET WE HAVE FOUND NO SUBSTITUTE TO EQUAL ITS SMOOTH, SENSITIVE ACTION. IT SAVES TAPS, LASTS LONGER AND INSURES ACCURATE HOLES.





SEVEN SIZES FROM THE FINEST TO 1" TAPS

MULTIPLE SPINDLE TAPPING HEADS

"A STANDARDIZED SYSTEM"

ETTCO HEADS ARE A MANUFACTURED PRODUCT ASSEMBLED TO FIT YOUR NEEDS.

DELIVERY IS FAST, SERVICE IS FROM STOCK PARTS, THE COST IS LOW AND YOUR JOB IS FROM 100 TO 500% FASTER.

LET US HAVE A PRINT OR PART OF YOUR SMALL PARTS — WE WILL BE PLEASED TO SEND A STANDARDIZED QUOTATION.

ETTCO TOOL CO.

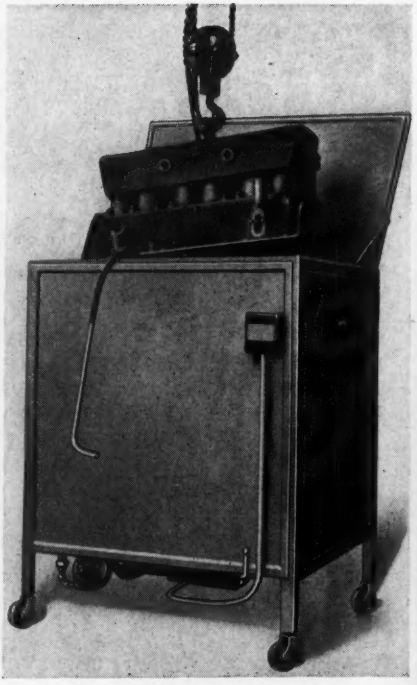
596 JOHNSON AVE. • BROOKLYN, N. Y.

as ball bearing races. A cylindrical shell of Kennametal (1 and 2) has been silver soldered to a steel handle (3). The Kennametal section "1" at right of relief groove has been accurately ground to 0.2495 in. diameter, and section "2" at left to 0.2500 in. diameter. In testing a bored hole, section "1" will slip in but section "2" will not, thus measuring size to within 0.0001 in. accuracy.

Kennametal is also used in follow rests, lathe and grinder center nibs, oil well pump valves, drill tip for masonry, stone, jig drill bushing, wire coiling tools, sand blast nozzles, tips for tongs on glass-working machinery, and many other wearing-resisting parts.

Phill-Co Degreasers

Portable degreasers, to be known as the "Phill-Co Degreasers," are now being marketed by Phillips Manufacturing Company, 340 W. Huron St., Chicago, Ill. The illustration herewith shows a Model 220 Phill-Co Degreaser which is 36 x 30 x 33 inches in size and operated at 220 volts A. C. The solvent capacity of this degreasing unit is four gallons. Agitation is provided by means of a power driven flusher for flushing off grease and dirt from metal parts of all kinds.



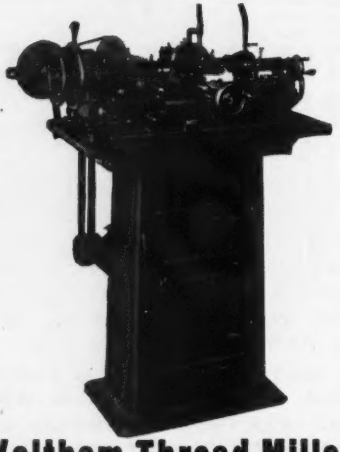
Phill-Co Degreaser

The solvent is generated into a vapor in a small generating tank which is located at the bottom of the machine. The parts to be degreased can be placed in the basket within the cleaning tank.

Hot vapor condenses on the parts and is said to remove all grease and oil. Parts are removed clean and dry, ready for painting or plating. The vapor level is maintained within the tank automatically.

Phill-Co Degreasers are electrically heated and controlled. One of the features of the Phill-Co Degreaser is that the unit is portable and can be taken to the place where parts are to be cleaned.

A Model 110 which is 36 x 22 inches and operates at 110 volts A. C. only is also available. This unit has a one gallon of solvent capacity.



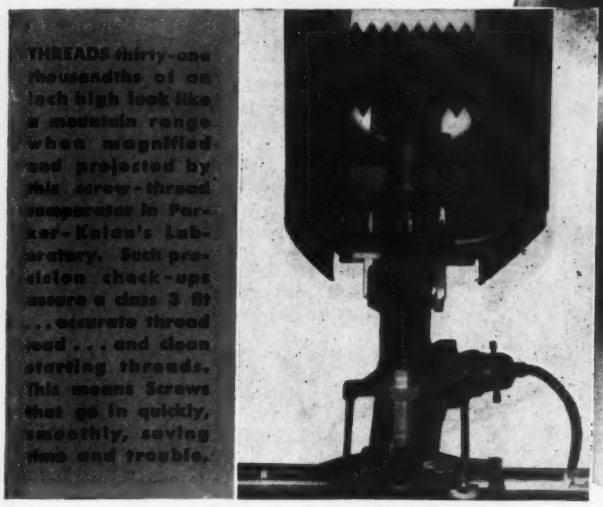
Waltham Thread Miller

Let us explain why this machine is largely used for special taps, single and multiple worms, etc., in tool rooms and factories.

WALTHAM MACHINE WORKS
WALTHAM, MASS.

A .031" Thread Becomes A Mountain

IN DIMENSION CHECKS GIVEN PARKER-KALON SOCKET SCREWS



THREADS thirty-one thousandths of an inch high look like a mountain range when magnified and projected by this screw-thread comparator in Parker-Kalon's Laboratory. Such precision check-ups assure a class 3 fit . . . accurate thread lead . . . and clean starting threads. This means Screws that go in quickly, smoothly, saving time and trouble.

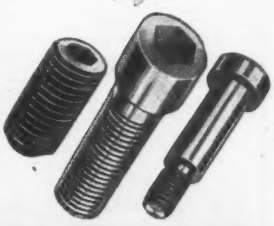
"16 POINT QUALITY-CONTROL" Leads Critical Buyers to Demand PARKER-KALON

Thread Precision is only one of the important characteristics carefully checked in Parker-Kalon Cold-forged Socket Screws. In a laboratory without counterpart in the industry, quality is guarded by thorough tests and inspections covering:

1—Chemical Analysis. 2—Tensile Strength. 3—Ductility. 4—Torsional Strength. 5—Ability to take Shock Loads under Tension. 6—Resistance to Shock Loads under Shear. 7—Hardness. In addition, there is a rigid inspection of these essentials: 8—Head Diameter. 9—Head Height. 10—Concentricity of Head to Body. 11—Socket Shape. 12—Socket Size. 13—Socket Depth. 14—Centricality of Socket. 15—Class 3 Fit Threads. 16—Clean Starting Threads.

In this way Parker-Kalon maintains a new higher standard of quality in Socket Screws . . . a standard that satisfies the most critical buyer. Send at once for free samples . . . see for yourself.

PARKER-KALON CORP., 198M Varick Street, New York, N. Y.

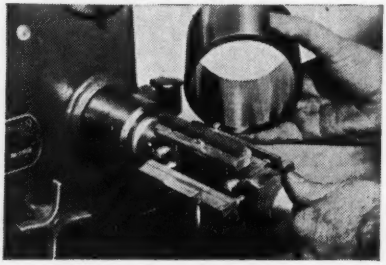


PARKER-KALON Cold-Forged **SOCKET SCREWS**

Special Adapter for Sunnen Cylinder Hone

The Sunnen Precision Honing Machine — product of Sunnen Products Company, 8003 Manchester Ave., St. Louis, Mo. — has been made more universal by the development of a special adapter to be used with the Sunnen Cylinder Hone. The illustration shows the cylinder hone mounted on a Sunnen Precision Honing Machine.

The adapter is made so that the Sunnen Cylinder Hone can be attached to the drive shaft of the Sunnen Precision Honing Machine and used in the same manner as a mandrel. The adapter increases the size range of the machine



Sunnen Cylinder Hone Mounted on Precision Honing Machine

to handle sizes from 2$\frac{1}{2}$ to 7 in. in diameter. The standard adjusting device on the cylinder hone is used to expand or contract the stones for different diameters. It is claimed that with this device excellent finishes can be obtained and errors of out-of-roundness held to within half a thousandth of an inch.

WHAT'S A *Small* DIAMOND GOT THAT A *Big* DIAMOND HASN'T?

ANSWER: A Greater Area of Hard-Working Tough Skin per Carat of Diamond

Carboloy dressers are loaded from base to peak with small tough-skinned virgin diamond particles permanently held in a special matrix. No remounting expense. No diamond loss or waste. Cutting surface renewed in 10 seconds whenever needed. Try one for your rough, semi-finish and finish grinding wheel dressing jobs. Send for catalog DR-38.

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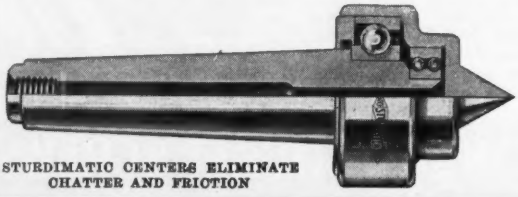
"Chicago" No. 55 Solenoid-Actuated Rivet Setter

What is believed to be the first multiple rivet setter to employ a movable anvil that is actuated by a solenoid has been developed by the Chicago Rivet & Machine Company, 1846 S. 54th Ave., Chicago, Ill. The design of the machine permits the employment of a special indexing fixture whereby the application of multiple setting to the line

IT TURNS WITH THE WORK . . . .



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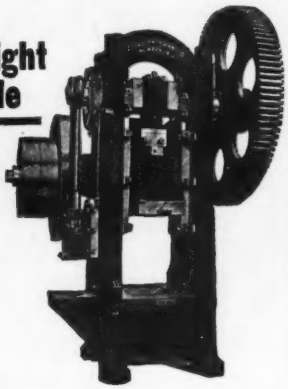

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(Patented)

First tool of its class with built-in motor and speed-changing mechanism, entirely eliminating mill-wrighting. Nothing under bench — Nothing overhead. Drive integral with the lathe itself. Marvelous compactness, using little more space than other lathes. Any powerful vibrationless speed at a turn of the hand wheel in front. Belted and wired, ready to run. Priced at only slightly more than other precision lathes with separate, complicated drives. Two splendid sizes. (Colored Bulletin J).

Also Stark Standard Precision Lathes, 6 sizes, ¼" to 1¼" capacity and up to 12" swing; with complete equipment. Stark Spiral Bench Millers, the most accurate of their type.

Stark Tool Co. Est. 1862 Waltham, Mass.
Originators of the American Bench Lathe

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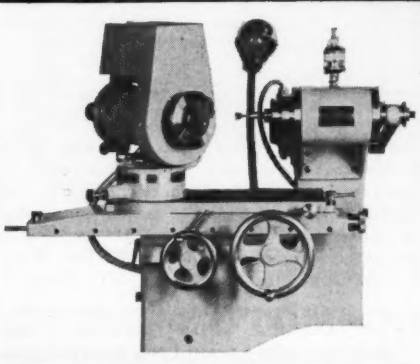
INTERNAL GRINDER
IG-1



An accurate grinder suitable for set-ups that require quick changes for straight, tapered and beveled holes or for single-purpose production. Diamond dresser automatically controls selected hole size.

By changing spindles, this model grinds all sizes of holes from 3/16" to 3".

Write for complete details

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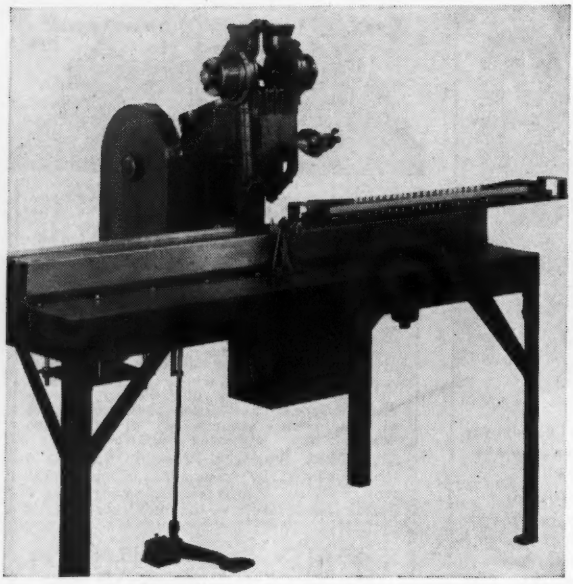


"Chicago" No. 55 Solenoid-Actuated Rivet Setter

assembly of small parts becomes more practicable.

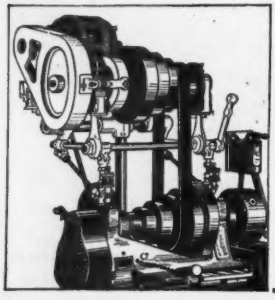
Pressure of the operating pedal causes the solenoid to actuate a toggle movement, raising the anvil into clinching position. When clinching is completed, the driver automatically raises and disconnects electrical contact with the solenoid. This movement causes the anvil to drop, permitting moving of the assembly fixture to the next position. The unit is adaptable for clinching both tubular rivets and eyelets.

Gairing Adjustable Micro-Nut

An interesting device known as the Adjustable Micro-Nut has been developed by The Gairing Tool Co., Detroit, Mich. Adaptable for use on either single or multiple spindles, it is claimed that the Micro-Nut quickly and accurately sets end-cutting tools to their correct length, and, in the case of multiple spindles, in proper relation to each other.

The device is graduated to permit adjustments ranging from 0.001 to 0.020 in., the adjustment being accomplished by an adjustable sleeve feature of the nut that works independent of the screw. The relative position of the cutting tool can be extended or retracted and measured adjustments can be made without guessing or interfering with the entire tool set-up.

In cases where the cutting tool must be extended or retracted more than 0.020 in., the set required is easily and quickly made by loosening the Allen screw in the Micro-Nut and turning the nut of the screw threads at an approximate estimate of the extension or retraction required (one complete turn of the whole unit equals 0.083 in., Allen screw stations at quarter turns). The Allen screw is then tightened and the final precision adjustment is made



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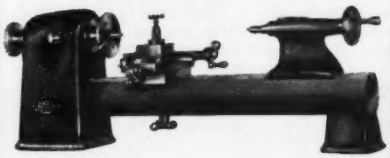

Precision lathes for doing most accurate turning, drilling, milling, threading, filing, polishing, in the tool room or in production.

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does 40% to 60% of the forming work turned out by the average shop.

Here's a profitable, economical brake idealy adapted for rapidly forming metal sections such as in stoves, refrigerators, soda fountains, steel cabinets, metal furniture, steel boxes, and a great variety of sheet metal specialties. Its variable speed drive operates from 17 to 50 strokes per minute. The No. 253 CHICAGO STEEL PRESS is accurate, compact, and ruggedly constructed of highest quality materials.

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150% LONGER LIFE

Chicago Mounted Wheels of V/T Super Bond have 150% to 300% longer life, according to tests in many plants on snagging and exacting operations. Will not ridge on welds, sharp corners, sinking dies, barbering, etc. There's a shape and size to handle every grinding job faster, better, at lower cost.

Let us send you a trial wheel. Tell us the kind of job, type of equipment used and size wheel you prefer.

HANDEE Tool of 1001 Uses

A small "power house" that can be carried to any part of the shop and used wherever there is an electric outlet.

Grinds, drills, polishes, cuts, routs, carves, sands, saws, sharpens, engraves, cleans, etc. Uses 300 accessories. Weighs 12 oz., 25,000 r.p.m. $18.50 postpaid with 6 Accessories.

Send for catalog of complete line.

CHICAGO WHEEL & MFG. CO.

Makers of Quality Products for 40 Years
1101 W. Monroe St., Dept. MM, Chicago, Ill.

on the graduated Micro-Nut.

The manufacturer claims that Adjustable Micro-Nuts, when used in connection with any standard adapter assembly or with tool holders and boring bars, will give the operator additional speed and precision accuracy that save time and work spoilage. Micro-Nuts reduce the attainment of close tolerances to an automatic method of simple

Gairing Adjustable Micro-Nut

arithmetic. Gairing Adjustable Micro-Nuts are available for all sizes of standard adjustable adapters. Special sizes can be furnished where needed.

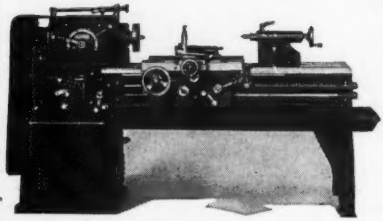
Model 566 Photo Electric Counting Equipment and General Purpose Contact Relay

Photo Electric Counting Equipment designed and proven under test for speed of counts up to 600 per minute is now being marketed by Lipman Engineering Company, 415 Van Braam St., Pittsburgh, Pa. The equipment is complete with a four-digit counter, light source, and electric contact relay unit. The photo electric contact amplifier relay unit, terminal board, power transformer for amplifier, and light source are all mounted as integral parts of the unit cover. The photo electric cell is mounted 4 in. from the opening, minimizing effects from stray light. One

New

"C & J"

15" and 16" Lathes



12 Speed Geared Head-Motor Drive
Timken mounted spindle
Modern Design—Liberal Dimensions
Write for bulletin.

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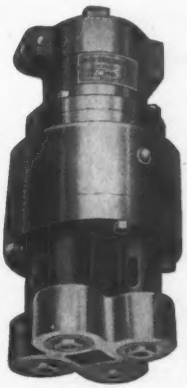
SPEED IN Drilling

U. S. Multiple Drill Heads are made for drilling 4 to 50 holes at once. Thus, you get more holes per minute and larger profits. Our years of specialization in this work will save you money and assure an accurate, dependable and swift job. Send your blue prints for estimates.



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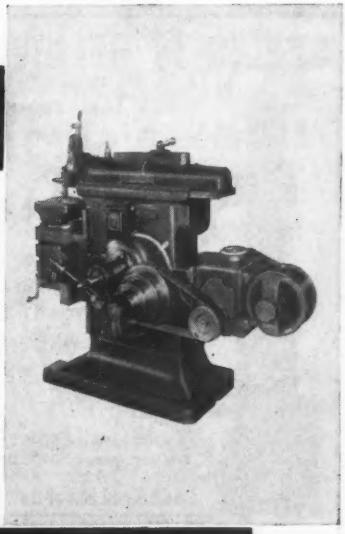
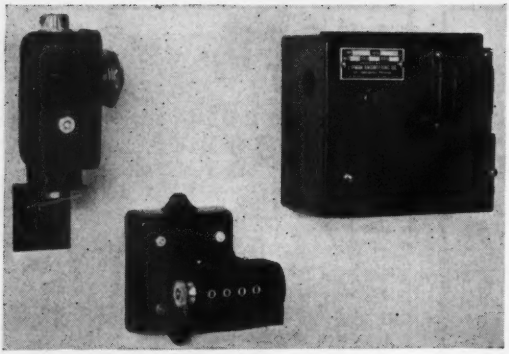
The Flexoid 4 speed control combines all the advantages of motorized control for machine tools in one compact, fool-proof, self-contained unit. A single hand control —at remote position if desired—operates all ratios with neutral position between changes. All hardened gears... ball bearing ... parallel input and output alloy shafts... rigid, solid construction ... all housed in one case ... motor mounted on unit. Write for descriptive data and prices.



The Smith Power Transmission Co.
410 LAKESIDE AVE., N. W., CLEVELAND, OHIO



Model 566 Photo Electric Counting Equipment and General Purpose Contact Relay

tube of standard type is used, having within it both rectifier and amplifier elements. Unit will operate on visible or invisible light. The control relay is of the plug-in type, with a pair of contacts that are closed when the light is on the cell. When the light is cut off, these contacts open and an additional pair of contacts close. The contacts will make or break and carry three amperes at 110 volts A.C. Estimated tube life, 7,000 to 10,000 hours.

Micro-Optical Pyrometer

The Pyrometer Instrument Co., 103 Lafayette St., New York, N. Y., has placed on the market the Micro-Optical Pyrometer, an instrument which permits measuring the temperatures of very small objects, such as incandescent lamp filaments, and for laboratory and scientific research work. The instrument has a twenty-fold magnification of the object which is provided by means of an optical arrangement of high candle power and 37 mm. aperture. The image of the smallest wire or filament under observation will fill the optical field and completely cover the tip of the pyrometer filament range.

The instrument operates on the principle of disappearing filament and is furnished with a direct reading scale

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When YOU see how a

WALTON TAP EXTRACTOR

Backs out broken taps without annealing, drilling or damaged threads

YOU'LL BE CONVINCED

That's why we ship on 30-days Free Trial.

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EVEREDE BORING BAR

The *ONLY* Boring Bar with the economical triangular bit.

Designed to use a larger diameter bar than formerly used because the chip is cut in front to make room for the bar. This gives you rigidity, higher boring speeds and heavier cuts.

SEND FOR DESCRIPTIVE FOLDER.
Representatives in all principal cities.

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WILLIS STUTSON
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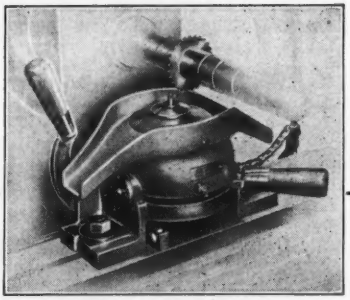

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MILLS OVER 1000 PARTS PER HOUR

Work held by draw in collets. Collets open and close automatically. Work automatically ejected. Indexes without loss of time for milling 1, 2, 3, 4, 6, 8, 12 or 24 sided pieces. Minimum set-up time required. Speeds up production. Positive and accurate in operation.

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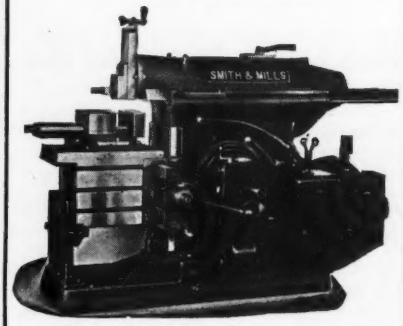

Automatic lubrication—forced feed. Multiple disc clutch and brake. Quick feed changes. Direct reading feed and stroke dials. Power rapid traverse to cross feeds.

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We are Constantly Finding Jobs Involving Contour Grinding and Fitting That Can Be Done Better and Quicker Than on Any Other Machine.

Write us for literature giving full description of these remarkable Profile Grinders.

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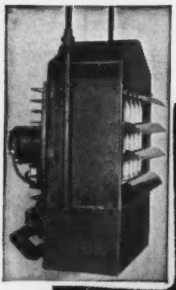

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Automatic Gas Fired Unit Heaters can reduce the cost and increase the efficiency of heating in your shop. Available in five sizes, they put heat just where you want it and when you want it, use no valuable floor space and operate without steam or water. Can also be used as fans in summer, for ventilation. Find out about Automatic advantages. *Write for new illustrated literature.*

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SHEAR-CUT END MILLS
Here's a complete line of Single and Double End Mills.
They save time and money.
Specify Progressive Shear-Cut End Mills.
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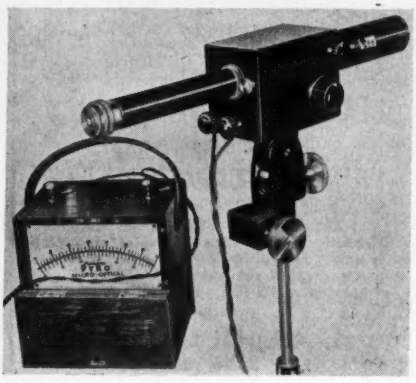
range from 600 deg. C. to 3,000 deg. C. and higher. The ammeter is compensated against variations in room temperature and has a so-called suppressed zero point in order to make better use of the scale, but only as far as is permissible with regard to constancy. The battery consists of four ordinary commercial flashlight cells. The unit is furnished with rigid support and tripod,



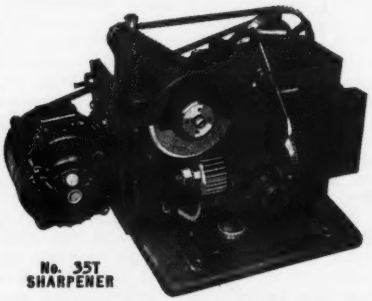
Micro-Optical Pyrometer

the instrument holder being equipped with a fine precision double worm gear arrangement for the most delicate adjustments in any desired direction.

Small Lincoln Welder for Belt or Direct Drive

A small arc welding machine designed especially for use by garages, blacksmith shops, job welding shops, contractors, machine shops, and so on, is announced by The Lincoln Electric Company, Cleveland, Ohio. Known as the "Shield-Arc" Junior," the welder has been built for use in conjunction with an engine or electric motor drive. Direct coupled to a gasoline engine or belted to a power take-off from an engine, or connected by belt to line shafting or an electric motor, the welder generates a smooth current for a wide variety of arc welding applications. It can be used with either bare or shielded arc type electrodes.

The "Shield-Arc Junior" is rated at



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Up to 5½" diameter and up to 1¾" thickness. 100 SAWS of 26 GAUGE CAN BE SHARPENED AT ONE TIME.

The saws are automatically indexed and sharpened within a variation of plus or minus .001 of exact diameter of entire lot.

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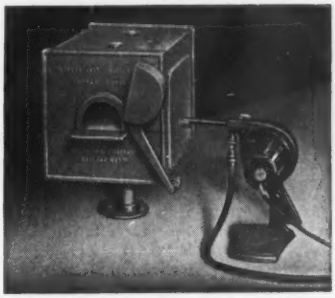
"Stark"

"ELECTROBLAST"

High Speed Heat in 20 Minutes



Powerful torch used separately as a very handy portable flame, $30. High Speed Muffle Furnace, no scaling or decarburization, reaches high speed heat in 20 minutes at 7c per hour; quickly saves its cost. Muffle 7"x3¼"x2½", $40. Also a larger furnace with built-in torch, muffle 7"x4½"x3½".

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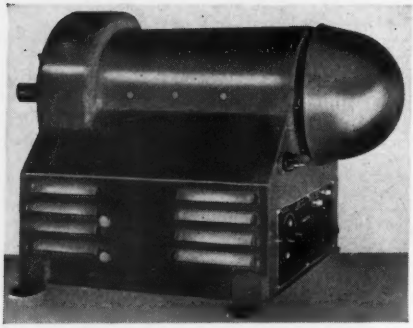


Lincoln Small Welder for Belt or Direct Drive

200 amperes and its current range, welding duty, 30-volt arc, is 60 to 250 amperes. The machine is 29⅝ in. long over pulley, 18 in. high with a base 15½ x 19⅝ in. Net weight is 320 pounds.

The outstanding feature of the welder is the system of voltage and current control with which it is equipped. This system of control, known as Dual Continuous Control, now made available for the first time on a small belt-driven model, permits independent adjustment of voltage and current, giving complete and separate control of arc heat and arc pentration for easy, speedy welding of any job. The ability to vary voltage and current independently of each other enables the user to get just the right size and type of arc for every job, whether it be for light sheet metal work or fabrication of heavier materials.

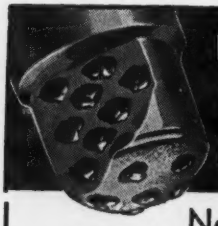
Equipped with Class B (non-inflammable) insulation, at proper points, the Shield-Arc Junior can be operated with relatively large size electrodes at high average current without danger of burning out, thus permitting faster, sustained welding at lower cost.

The generator is single-operator, variable voltage type with laminated pole pieces. The armature is mounted on a large shaft with pulley. Construction is arc welded steel, drip-proof. The welder is fitted with four steel feet welded to the base and drilled for bolting. The machine occupies a space less than two feet square.

Erickson Precision Collet Drill Chuck

A collet-type precision chuck for drills, end mills, and so on, which is said to possess unusual grip and extreme ease and accuracy of set-up, even when broken drills are used, is now being manufactured by Erickson Steel Company, E. 80th St., and Bessemer Ave., Cleveland, Ohio. The chuck consits of only four simple parts—the shank, shank grip-nut, collet, and nose-piece. All working faces and the concentricity of holes, bearings, and angles are held to a tolerance of one ten-thousandth of an inch. The collet is inserted in the shank and the nose-piece tightened down upon it by means of the shank grip-nut, thus avoiding all possibility of twisting the collet during the process. The hexagon on the outside of the nose-piece makes a set-up easy by permitting two wrenches to be used.

The collet is unusually collapsible, and will firmly and accurately grip drill and end mill shanks whose diameters differ by as much as one thirty-second of an inch. Its construction, moreover, provides an eight-point grip instead of the usual three or four-point one, thus giving added resistance to



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Whole, unbroken diamonds of high quality and extreme toughness are spaced regularly throughout the matrix to give great accuracy, uniform dressings and to hold wheel to size. These stones are anchored permanently in their matrix by strong chemical bonds that will not break under heat, pressure or rough abuse. No remounting! Lowered costs! After tool is put in machine it will give best results if left in original position. It is not necessary to turn or alter the area in contact with the grinding wheel.

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NEAT STAMPING in NAME PLATES

This machine quickly stamps details and serial numbers into name plates.

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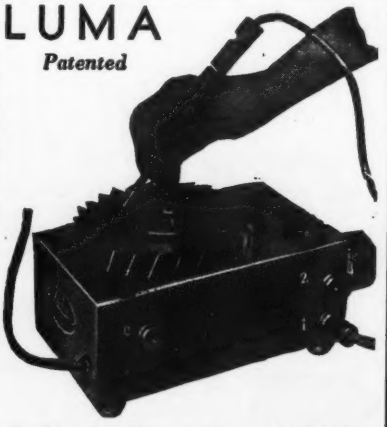

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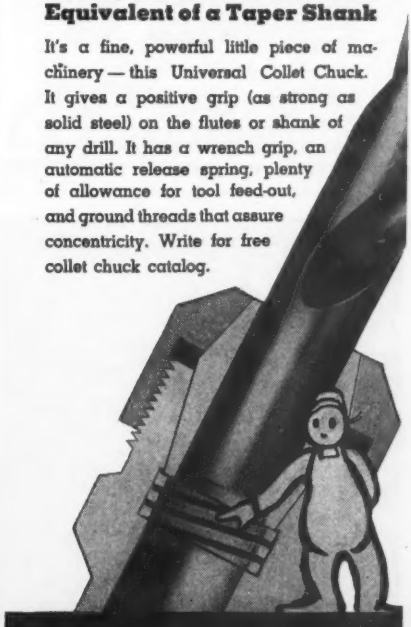
It's a fine, powerful little piece of machinery — this Universal Collet Chuck. It gives a positive grip (as strong as solid steel) on the flutes or shank of any drill. It has a wrench grip, an automatic release spring, plenty of allowance for tool feed-out, and ground threads that assure concentricity. Write for free collet chuck catalog.



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loosening up. Since the collet grips equally well on flutes or shanks, broken drills or mills can be used without loss of accuracy.

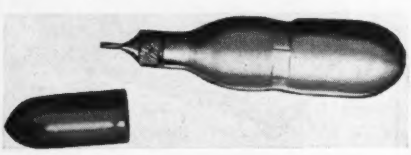
The chuck shank has an unusually deep hole, thus permitting a drill to be set far enough back to prevent vibration. This, and the eight-point collet grip, minimize breakage risk even when heavy feeds and high speeds are used. The hardened nose-piece is of small diameter to permit working close up to flanges, in grooves, and so on, besides giving the operator a clear view of the work in hand. It may also be used as a stop if required—a useful feature on portable drills and similar equipment.

Chuck and parts may be supplied separately, or a complete set for Morse taper chucks with collets covering from ½-in. diameter to No. 80 drill size can be supplied in a substantial lock-box. Brown & Sharpe or Jarno tapers, parallel shank type, and so on, can be furnished on special order.

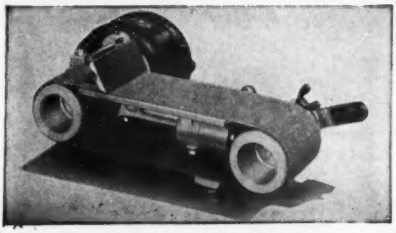
Erickson Precision Collet Drill Chuck

Kompact Stylo Oiler

The stylographic oil applicator now being marketed by J. A. Honegger and Associates, 223 Spruce St., Bloomfield, N. J., makes it possible to deliver a measured amount of oil to any surface by merely applying the stylographic point to the work and pushing on the housing. Each "pump" delivers one drop of oil. The compact design makes



Kompact Stylo Oiler



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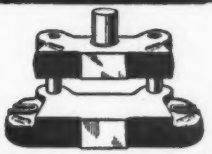

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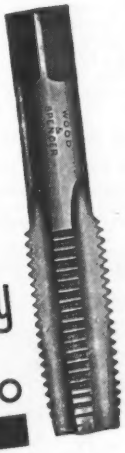

THE WOOD & SPENCER COMPANY
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the oiler especially useful in that it will fit into a vest pocket or small tool or service kit. With its cover, the oiler is clean and convenient.

Ross All-Air Pilot Controlled Valve

The Ross Operating Valve Company, 6484 Epworth Blvd., Detroit, Mich., announces an all-air, pilot controlled valve, designed for semi-automatic control, full automatic control, or remote control of double acting air-cylinders.

Ross All-Air Pilot Controlled Valve

It is claimed that this new system is especially well suited to manufacturing problems calling for a series of successive operations, demanding rapid and accurately timed progressive movements such as for spot or seam welding of automobile body parts or for other production work requiring similar, positively dependable action.

The valve, which is fully air operated, is actuated by pilot controls and these pilots are made in various designs to meet the immediate control demands, as for hand, foot, or mechanical action with a push, cam, toggle or other desired movement.

Although the new all-air actuated valve is different in design, it retains the fundamental poppet construction features, with its air seal and rapid action advantages, of the Ross line of air valves.

SCHAUER Speed Lathes

PRODUCTION NECESSITIES

TIME SAVERS IN ANY PLANT

Designed especially for reducing time of secondary operations as lapping, polishing, filing, finishing and burring of small parts. Equipped with 2 speed motor—automatic brake—collets or 3 jaw chucks—hand operated or automatic. Many interesting applications shown in Cir. No. 380 —Write for it.

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A trial will prove to you, as it has to countless other manufacturers, that "Unbrako" Screws can be depended upon to meet the severest requirements.

Also, "Unbrako" Socket Head Cap Screws have the distinctive knurled heads that provide a better grip. Write for our latest "Unbrako" catalog. It's handy for reference.

Fig. 232 "UNBRAKO" Hollow Set Screw

Fig. 1434 Knurled "UNBRAKO" Socket Head Cap Screw Pats. Pending

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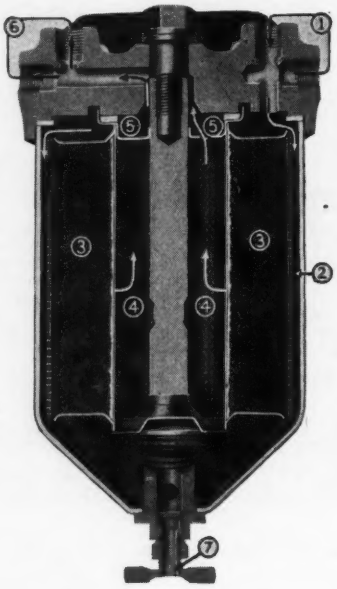
For the protection of bearings used on grinders, automatic screw machines, and other machine tools, an oil filter has been developed by the AC Spark Plug Division, General Motors Corporation, Flint, Mich. The filter, known as the Type T-1, is easily installed. It is said to remove all solid impurities such as fine metal chips from the oil, thereby protecting the bearings and enabling a machine to do better work, especially from a precision standpoint.

The various steps in the filtering of the oil are indicated in the accompanying illustration and are as follows: 1. Unfiltered oil enters through optional inlet. 2. Oil flows into drawn steel case. 3. Oil is forced through "Igneonite" filtering element. 4. Brass collector tube into which filtered oil enters after passing through filter element. 5. Clean oil passes through annular passage. 6. Clean oil discharged through optional outlet. 7. Drain cock for draining accumulated dirt and water from sump.



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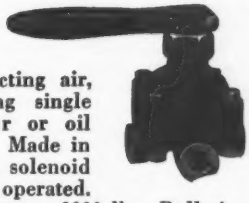

or double acting air, For operating single steam, water or oil cylinders. Made in lever, foot, solenoid and motor operated. All pressure up to 3000 lbs. Bulletins on request.

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(INCORPORATED)

251 CENTER ST. NEW YORK CITY

Stanley No. 155 Diamond Wheel Dresser

A fixture designated as the No. 155 Diamond Wheel Dresser is now available for use with the Stanley Contour Grinder, a product of the Stanley Electric Tool Division, New Britain, Conn. The fixture provides an inexpensive means of trueing and dressing grinding wheels or points. A ring on the bottom of the dresser fits into a counterbored hole on the table top of the grinder. A large knurled adjusting screw is provided for setting the dresser. The holder in which the diamond (¼ to 1/3) carat) is mounted is adjustable. A small knurled screw is provided for accurate setting of the diamond and to regulate the depth of cut.

The Stanley Contour Grinder is used

Stanley No. 155 Diamond Wheel Dresser

by tool and diemakers for finishing dies, gages, templets, and special shapes. Its motor is held in a holder which can be adjusted from 90 to 45 deg. The mounted point, wheel, or rotary file projects through the table.

Jessop "D" Die Section

A die section, designated as Section "D," has just been added to their line of rolled composite die section shapes by the Jessop Steel Co., 608 Green St., Washington, Pa. Section "D" was developed for making smaller dies used

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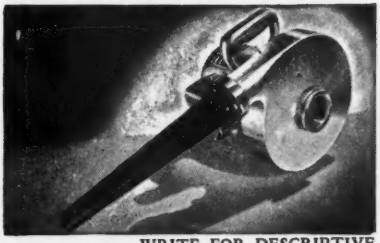

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A simple and excellent device for balancing, straightening and trueing.

They are made in the following sizes:

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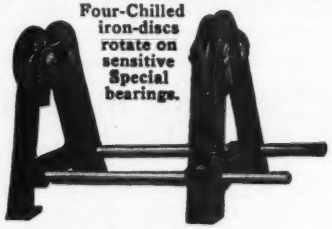
20 in.	20 in.	1,000
40 in.	30 in.	2,000
60 in.	30 in.	2,000
72 in.	66 in.	5,000
96 in.	88 in.	10,000



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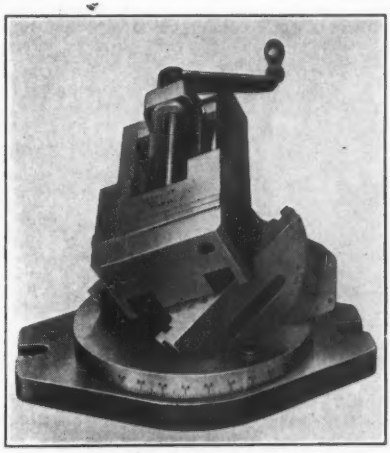

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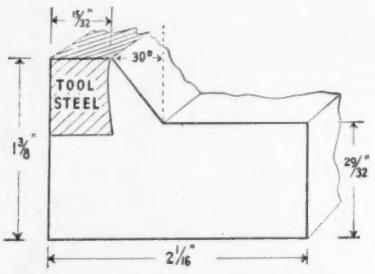
in the manufacture of toys, refrigerators, containers, and other articles where composite die sections of smaller size than hitherto available, were needed.

Jessop rolled composite die sections,



Jessop "D" Die Section

which are now available in eight shapes, consist each of a tool steel cutting edge backed by non-hardenable soft steel. Principal advantage over solid tool steel sections lies in the fact that they may be hardened before drilling dowel holes, thus eliminating expensive lapping operations and assuring a good fit of sections on holder. Composite sections may also be hardened to a slightly higher degree than solid tool steel because the tough soft steel backing "cushions" the shock in cutting; also, any slight warpage which takes place during heat treatment of the composite section may be readily corrected on a pusher type straightening machine, whereas a hardened tool steel section might break.

Because Jessop composite die sections are rolled rather than forged they may be produced in longer lengths, which reduces set-up time on machines as well as machining time. Being rolled to shape they save from 28 per cent to 47 per cent, depending on the section, in machining and original purchase weight as compared to rectangular sections.

Jessop rolled composite die sections may be formed either hot or cold to special shapes without harm to the weld, since practical tests have proved that the weld is as strong or stronger than the component parts. They are now being used in dies for auto bodies, stoves, refrigerator panels, aeroplane metal sheet shapes, railroad cars, truck bodies and other products where sheet

New Nesting Type Tote Pans

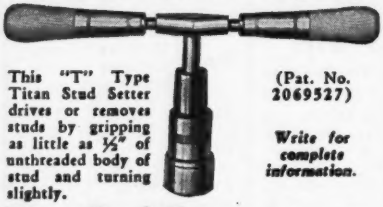
Lots of 50
$1.00 each

20" long x 12" wide x 6½" deep.
16 ga., drag holes and handles both ends.

Lots of 100 & 200 less 3%; 300 up less 5%

J. L. LUCAS & SON, INC.
1 Fox Street Bridgeport, Conn.

SET STUDS "The Roll Grip Way"

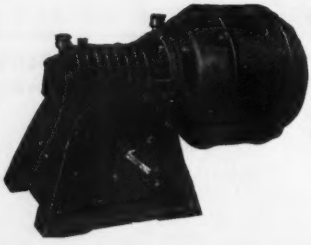


This "T" Type Titan Stud Setter drives or removes studs by gripping as little as ½" of unthreaded body of stud and turning slightly.

(Pat. No. 2069527)

Write for complete information.

Titan Tool Co., Fairview, Pa.



Janette Speed Reducers

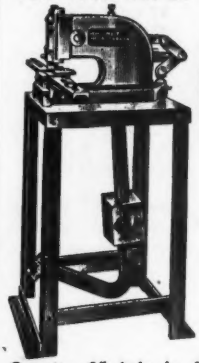
43 SIZES FROM 1/50 TO 10 H.P.
Speeds from .0083 to 1140 r.p.m.

The diversity of Janette motorized and motorless reducers enables you to select the style of compact, rugged speed reducer, to exactly meet your individual requirements. *May we give you complete information.*

MOTOR GENERATORS—CONVERTERS—DYNAMOTORS

Janette Manufacturing Company
556-558 West Monroe Street
Chicago

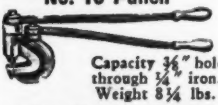
Foot Press No. 28



Angle Iron Shear No. 4

Capacity 2x2x¼" Angle Iron Weight 44 lbs.

Capacity 2" hole in 16 gauge—100 holes per min. No. 10 Punch



Capacity ⅝" hole through ¼" iron. Weight 8¼ lbs.

ASK FOR CATALOG No. 13

•

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Whitney Metal Tool Co.

110 FORBES ST. ROCKFORD, ILL.

Why Use A Shaper

to cut Keyways when a

DAVIS KEYSEATER

will do the job so much quicker and better?

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Exchange and Glasgow Sts.
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MARQUETTE

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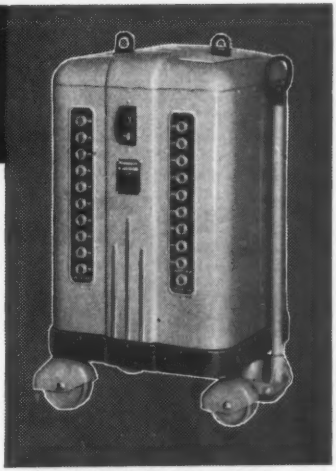
is built to produce sound, strong ductile welds. Welds which will meet your shop standards, thus eliminating rejects and saving you money. The elimination of "magnetic blow" plus the continuous reversing action of alternating current assures you of high quality welds.

The elimination of rejects is just one of the ways to save money with a Marquette. The low original cost plus the low operating cost (power savings up to 15% over comparable D.C. machines) and negligible idling time loss (idles on 5% of regular power consumption) combine to give you welds at a saving.

For complete details write Dept. E.

Listed by Underwriters' Laboratories, Inc.



Model 400 B T pictured above.

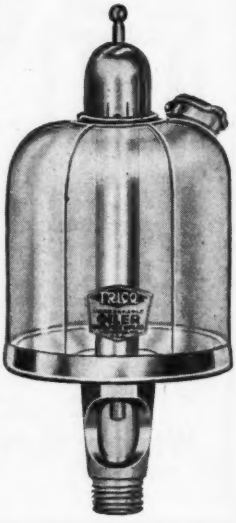
MARQUETTE MANUFACTURING CO.

MINNEAPOLIS, MINN.

metals are to be cut to regular or irregular shapes. Samples and complete information on any of the sections will be sent upon request.

Trico Unbreakable Gravity Feed Oiler

A line of visible gravity feed oilers, modernized, streamlined, and with unbreakable reservoirs, has been announced by the Trico Fuse Mfg. Co., Milwaukee, Wis. The oiler illustrated is mounted at the top of the part to be lubricated and any predetermined number of drops of oil per minute can be obtained by a simple adjustment of the ratchet control. After the desired adjustment has been made, no further attention is required except to keep a reserve supply of oil in the bottle. The shut-off lever at the top, when in a vertical position as shown, feeds oil, and when tilted to the side, stops the flow.



Trico Unbreakable Gravity Feed Oiler

The oiler is equipped with dual ratchet springs and a heavy tension ring that fits over the ratchet springs, assuring uniform pressure on the ratchet feed and extreme vibration or careless handling can not change the adjustment. There are no gaskets to leak as the unbreakable bottle is cemented and roll-clinched to the heavy brass base. All metal parts are bright cadmium-plated for beauty and easy cleaning.

The dome is streamlined and hides the ratchet lever mechanism and the filler-cap is dust-proof and self-closing. The sight fitting is streamlined with wrench-grip at the top. The oiler is made in three styles, in 1, 2, 4, and 8- oz. capacities.

GRINDING WHEEL DRESSERS

We make all types of Dressers and Cutters

Write for Catalog "M"

DESMOND-STEPHAN MFG. CO.
URBANA, OHIO
The Canadian Desmond-Stephan Mfg. Co., Ltd.
Hamilton, Ontario, Canada

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—in the finer Pitches—14 to 96 D. P.

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SPIRALS GEARING
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BEVELS RATCHETS

High precision or commercial production. A few pieces or a million.

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FULLY GUARANTEED
Two Sizes

No. 1 cuts up to No. 11 gauge strip or sheet.
No. 2 cuts up to ¼" steel plate.
Special Blades for shearing stainless steel.

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Frictionless —Rotary

For core drilling, T. C. and high speed boring, turret tool piloting, etc. Won't stick or clog. Dust proof as a watch. *Write for details.*

GIERN & ANHOLTT TOOL CO.

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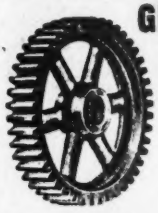

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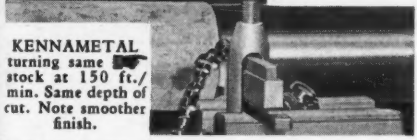
30% LESS FLOOR TO FLOOR TIME with **KENNAMETAL**

High speed steel turning unannealed forging at 46 ft./min. Depth of cut. 1/16 to 3/4".



KENNAMETAL turning same stock at 150 ft./min. Same depth of cut. Note smoother finish.

THE above illustration shows a high speed steel tool (background) and a KENNAMETAL-tipped tool (foreground) turning identical unannealed forgings. Note smoother finish produced by KENNAMETAL (surfaces of stock unretouched). On this typical turning job, KENNAMETAL cut floor to floor time by 30%, and required less down time for re-grinding tools.

KENNAMETAL machines steel of any hardness up to 550 Brinell at modern high speeds. Write for complete information today.

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300 LLOYD AVENUE

LATROBE, PENNSYLVANIA, U.S.A.

YEARS *and*

YEARS and

YEARS

OF

UNINTERRUPTED

GRINDING

SERVICE

PACKED WITH POWER

for tough pulling on grinding, buffing, finishing, polishing and hundreds of other every-day shop operations. Surprising in performance and still more surprising in endurance. Users write that it is "almost unbelievable" that such a small tool could stand such constant use, daily, year in and year out.

1/2c PER DAY would easily cover the total cost — original price and upkeep — spread over the years of use of the average Moto-Tool now in service.

Thousands Used in Industry Throughout The World

TOUGH!

47,000 R.P.M. of the Master Model 2 Moto-Tool insures conservation of cutting wheels and points and permits precision workmanship.

Long Motor Life: Motor cooled by internal fan; dust excluded by vacuum-cleaner type filter.

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MOTO-TOOL

Handles over 200 interchangeable accessories. Plugs in anywhere—A.C. or D.C. Weighs only 13 oz. Sells for $16.50. Complete grinding and carving kit $23.50. See genuine Dremel Moto-Tools at better Dealers or order direct on 10-day money-back trial. Write for FREE catalog of other Dremel tools and equipment.

Oversize armature shaft in oilless (oil-sealed) type bearings, avoids wear and vibration.

Precision built for precision work: more tool performance for your money.

DREMEL MFG. CO.

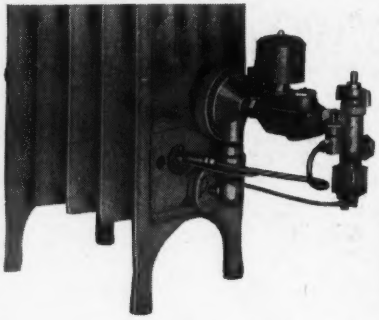
Dept. 229-L Racine, Wis.

Automatic Gas-Steam Radiator with Automatic Control and Safety Pilot

The Automatic Gas Steam Radiator Company, 470 Brushton Ave., Pittsburgh, Pa., announces an automatic control and safety pilot for its line of gas-steam radiators, available with or without room thermostat. Either natural or artificial gas may be used as fuel.

Constructed of cast iron and practically indestructible, the gas-steam radiator is designed for heating offices, stores, small shops and other places where it is not desirable or practical to operate big boilers. It is available in both vented and unvented types and operates automatically without boiler, water pipes, coal, ashes or janitor service.

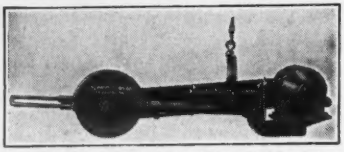
The new device uses a constant-burning pilot and a positive safety pilot. Its design is such that it is impossible to obtain a flow of gas to the burner in the absence of a pilot flame. The operation is extremely simple; it is only necessary to turn the valve with the reset button and ignite the pilot flame. Within a few seconds the valve will remain open. The valve will snap closed in the event of failure of the pilot flame, giving 100 per cent shut-off.



Section of Automatic Gas-Steam Radiator Showing Automatic Control and Safety Pilot

Automatic gas-steam radiators are officially approved by the American Gas Association and listed as standard by the Underwriters' Laboratories.

MUMMERT-DIXON SWING FRAME GRINDERS



Sizes 12", 14", 16", 18", 20" and 24" wheels.
ASK FOR DESCRIPTIVE CIRCULAR
MUMMERT-DIXON CO.
120 Philadelphia St. • Hanover, Pa.

STRAIGHT-CIRCULAR-IRREGULAR CUTTING OF SHEET METAL

BEVERLY cuts flat to any size or shape. Three sizes: No. 1, weighs 16½ lbs.; cuts up to 14 gauge. No. 2, weighs 32 lbs., cuts up to 10 gauge. No. 3, weighs 55 lbs., cuts up to ¼ gauge.
Write for circulars and prices.
BEVERLY
Throatless Shear Co.
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Chicago Illinois

NO BELT SLIPS WITH VACUUM CUP METAL PULLEYS

Pat'd U. S.
Canada
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30 Day Free Trial Offer.

Solid and Split
Sizes 2" to 72" Dia.

Shut Off Expense Caused by Slippage You Save Money on Every Installation

NEW LOW PRICED PRODUCTION LINE
SEE PART LIST Prices Below **Send for List—On the Shelf**

Dia.	Face	Price	Dia.	Face	Price
2	"x2½"	$1.25	4	"x4½"	$3.20
2½	"x2½"	1.45	4½	"x4 "	3.35
2½	"x3½"	1.65	4½	"x5½"	3.95
3	"x3½"	2.25	6	"x5 "	4.75

Increase your Production

Try one at our risk on your worst drive. You be the Judge.
VACUUM CUP METAL PULLEY CO., INC.
12533 Grand River Ave., Detroit, Mich.

FLOATS RADIALLY

ZIEGLER
ROLLER DRIVE
Floating Holder
FOR
TAPS — REAMERS
COUNTERBORES
DIE-HEADS

"IT ALWAYS FLOATS"

Compensates for spindle misalignment, eliminating over-sized or bell-mouthed holes.

Much set-up time is wasted, many parts are scrapped, trying to produce uniform and accurately tapped and reamed holes on machines with spindles out of alignment with the work. Many taps are condemned for this reason and many holes are reamed bell-mouthed or oversize. A Ziegler Floating Tool Holder will eliminate these difficulties. A trial on your most difficult job will convince you.

Holders made to meet all requirements. Literature upon request.

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STEEGE Drives are easily installed — prices $35.00 up—sent on 30 days' approval. *Let us send catalog.*

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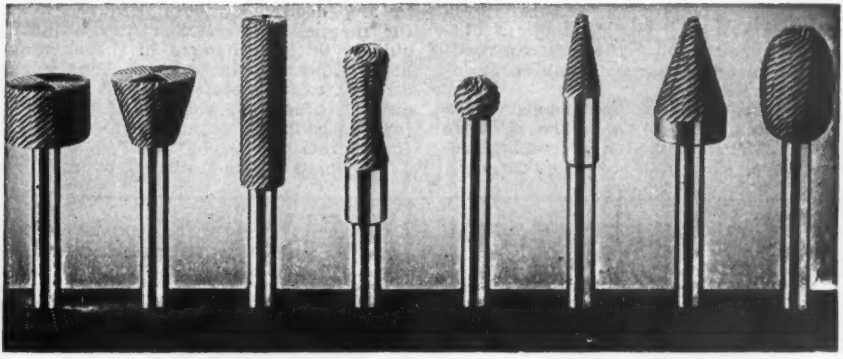

Just a few of the many standard shapes which are carried in stock.
Write for full information.

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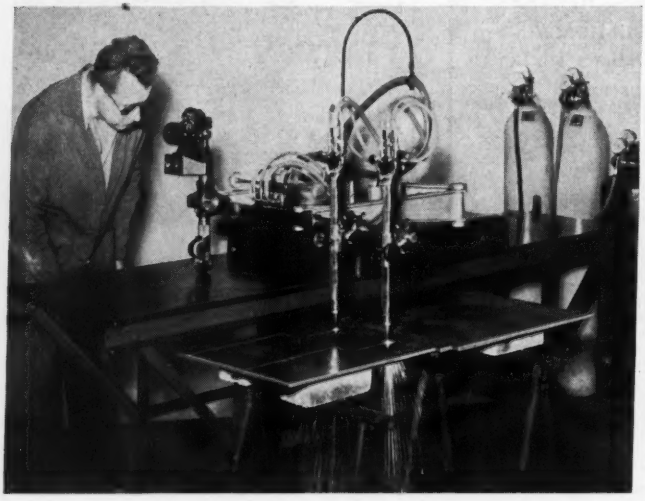
408 PERSHING AVE. DAVENPORT, IOWA

Airco No. 10 Planograph

The extreme flexibility of use of the Airco No. 10 Planograph announced by Air Reduction Sales Company, 60 E. 42nd St., New York, N. Y., is demonstrated by its ability to gas cut straight lines, rectangles, circles, and irregular shapes from ferrous metal of any thickness within the present practical limits of the cutting torch. Although a stationary-type machine, the unit can readily be moved by crane to different localities in the shop.



Airco No. 10 Planograph

The No. 10 Planograph consists of a tracing table upon which the carriage travels. The torches and tracing devices are supported on the carriage. Operating on either 110 or 220 volts A.C. or D.C., the unit requires a minimum of floor space. Including the work table, the planograph requires a working area of only 5½ x 10½ feet.

The cutting range in single torch operation is 24 in. wide by 72 in. long. This length can be increased indefinitely in multiples of 72 in. by utilizing additional tracing tables. Maximum diameter of circle cuts is 24 in.

When two torches, mounted on the regular operating bar, are employed for simultaneous cutting, the cutting area for each torch is 12 in. wide by 72 in. long. Two circles each up to 12-in. diameter can also be cut with the torches mounted in this manner. By using an auxiliary bar, the cutting area of each is 24 x 24 inches.

The tracing device for manual tracing can be locked so that it will, without manual guiding, travel in a straight line in any desired direction. The devices for magnetic and templet tracing can quickly be interchanged in the existing head. The magnetic tracer, connecting directly to an electrical outlet conveniently located near the top of the tracing device head, requires 110 volt D.C. for operation.

The speed of the motor is governed by

SAROSTON

Precision Tool Room Grinder

For Engine Lathes

SIZES FROM ⅛ TO 2 H.P.

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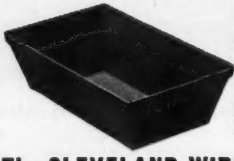
We Fill Your Steel Shop Equipment Needs



Write to us for complete catalog on barrels, kegs, pails, racks, shelving, etc. We design for service and durability.

The CLEVELAND WIRE SPRING Co.

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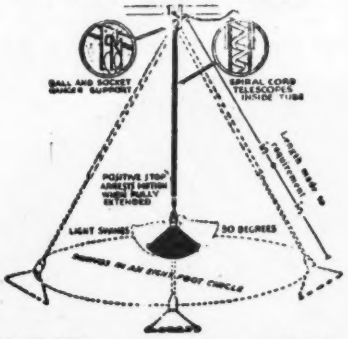
UNIVERSAL MOVABLE LIGHT



NO GLARE . . . Push it up . . . pull it down . . . swing it out . . . swing it around . . . *and it stays put.*

Avoid strong illumination causing headache.

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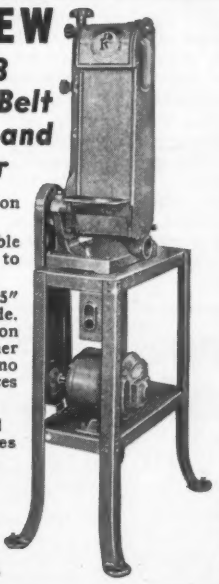
1325 South Mint St. Charlotte, N. C.

IT'S NEW

No. 608 Abrasive Belt Surfacer and Polisher



A real production machine.

Quickly adjustable from vertical to horizontal.

Work table 15" long by 6" wide. Exhaust connection for vacuum cleaner bag. No dust—no dirt. Other sizes and types.

Centerless Feed Polishing Machines for Cylindrical Work.

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Greenfield, Mass.

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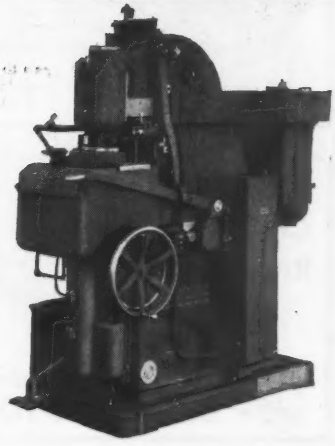


Raising or lowering wheel head automatically starts or stops the table and magnetizes or demagnetizes 12" magnetic chuck. Other features include wheel head locking device and adjustment of upper portion of column for grinding saws, cutters, etc., having hubs up to 6" diameter. Six table speeds are available and a foot brake facilitates quick stopping of table.

O. S. WALKER COMPANY, INC.

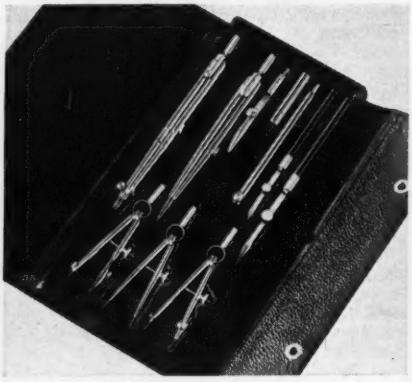
WORCESTER • MASS.

a graduated disc known as the Index Speed Control which provides a complete range of motor speed in one full turn of 360 deg. The cutting speed in inches per minute is registered on the reversible tachometer.

The gas control unit on the No. 10 Planograph is centrally located. A knob handle operates cams, progressively arranged, one each for the pilot light, acetylene (or other fuel gas), oxygen preheat, and cutting oxygen. One complete cycle lights and cuts off in proper sequence.

K & E "Minusa" Drawing Instruments

American-made drawing instruments, developed for "straight line" production, are now being manufactured by Keuffel & Esser Co., Hoboken, N. J.



K & E "Minusa" Drawing Instruments

The instruments are called "Minusa," a name made by contracting "Made in U. S. A." They have a slender rounded taper construction, designed to produce excellent balance and a maximum of strength. Use of a special hard rolled nickel silver stock lends unusual rigidity to compasses, dividers, and springbows. Careful hand fitting of all moving parts insures smooth, even action.

Although the first sets are already in the hands of key dealers and volume production is now under way, until manufacturing facilities can be extended, Minusa instruments will be offered in complete sets only. The single

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Carboloy-Tipped
Reamers
Produce up to fifty times as many smooth, accurate holes without resharpening when compared to high speed steel reamers. Their cost is surprisingly low.
Write for price schedule. Sold through Carboloy Company or direct.
STAPLES TOOL & ENGINEERING CO.
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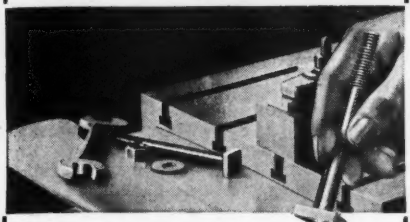
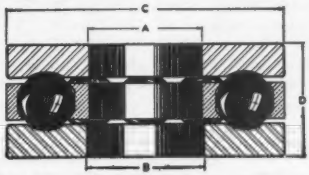
SMB
MACHINE BOLTS

MACHINE BEDS RETAIN THEIR ACCURACY LONGER WHEN S M B BOLTS ARE USED.



BOYAR-SCHULTZ CORPORATION
2120 Walnut Street, Chicago, Illinois

GWILLIAM



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4-JAW INDEPENDENT LATHE CHUCKS

L-W Lathe Chucks are built with semi-steel construction and heavily ribbed body to withstand unusual strains. Four independent jaws made of accurately ground and fitted hardened steel are reversible and have 1¼" tough nickel steel screws. Best material and workmanship guarantee satisfactory service.

Now Made in 5 Sizes

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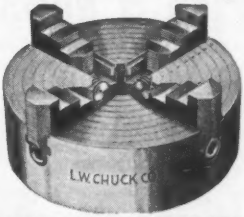
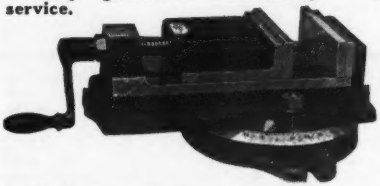
12"	31.00
14"	36.00
16"	45.00
18"	58.50





L-W also manufactures Magnetic Chucks, Demagnetizers, Dividing Heads and Power Hack Saws.

SWIVEL MILLING MACHINE VISES

Large, Semi-Steel, 85 lbs. Made in Two Sizes
This large semi-steel vise which can be used plain or swivel is suitable for milling machine, drill press or shaper. Has sturdy 6½" steel jaws; key slots provide for attaching to machine table holding surface and jaws at right angles or parallel to table. Shipping weight 90 pounds.

6½" size	$27.00
4½" size	$19.50

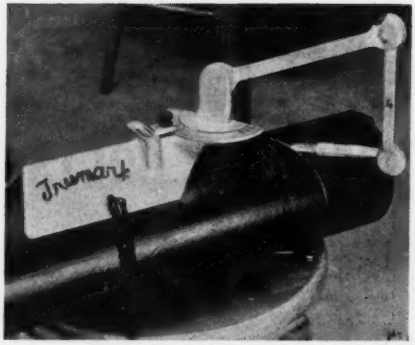
Send for a catalog of the complete L-W Line.

L-W CHUCK COMPANY
20 N. ST. CLAIR STREET **TOLEDO, OHIO**

exception is the large ruling pen which is available in unlimited quantities.

Trumark Protractor

According to the manufacturer, Advance Sales Company, 1003 E. Slauson St., Los Angeles, Cal., important savings in shop and field time on welded pipe and steel installations have been made by the use of the Trumark Protractor illustrated here. This marking device gives rapid and accurate cut lines on any size of pipe, angle iron,



Trumark Protractor

I-beams, rectangular shapes and sheets, for torch cutting, sawing, or shearing.

The device is said to eliminate the use of templates, wrap-arounds, and engineering computations, do away with guesswork, and save time and material. It can be used by anyone, in the field or the shop, without previous experience or layout training, to obtain accurate cut marks.

The Trumark Protractor is placed on the pipe or any rectangular shape and is held in level position by a strong spring chain. The level is determined by a bubble indicator. Any desired angle for the cut is set on the 180 deg. scale. The marking arm may then be moved completely around the pipe. The marking is done by a special chalk that will not blow off and is easy to follow. The protractor is rigid in marking position and scribes a true line. Construction is of cast aluminum alloy. Four models handle pipe up to 3, 6, 12 and 36-in. respectively.

QUICK and ACCURATE

No. 35 FLYNN

MICROMETER OFFSET BORING HEAD HAS RIGIDITY *PLUS* A Large Range 2" OFFSET

¾" bar or tool capacity. Bores ½" to 12" dia. holes.

Write for catalog.

FLYNN MANUFACTURING CO.

437 Bates St. • Detroit, Mich.

Mark It Quickly *with a* NUMBERALL

Made with 1 to 10 wheels. Stamp in perfect alignment. Shank for Hand or Press Stamping. Platform for stamping Name Plates and other small articles.

No. 45 Platform

NEW Quick Set Machine. One wheel can be turned quickly by knurled knob for consecutive numbering.

NUMBERALL STAMP & TOOL CO.

Huguenot Park, Staten Island, N. Y.

HOLD-HEET *says When!*

A Sturdy, Dependable Lance Pyrometer

Shows you the correct temperatures in heat treating, annealing, tempering, clay baking, salt baths, tempering and annealing solutions. Ends costly guess-work.

Write for Circular

RUSSELL ELECTRIC CO.

338 W. Huron St. Chicago, Ill.

Thermocouples $1 to $4 extra.

ONLY $16

10 DAYS FREE TRIAL

Hold-Heet Pyrometers

NEEDLE POINT DIAMOND TOOLS

N-2 N-1

Indispensable in grinding taps, threads, gauges and for sharpening corners and contours on fine grain wheels.

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F. F. GILMORE & CO.

112 Dartmouth St. Boston, Mass.

Complete line of Standard and Special Diamond Tools

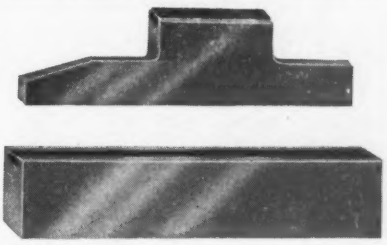
$1.00 EACH

Discounts in quantities

CENTERLESS GRINDER BLADES . . . . . give

(1) 10-30 times longer life
(2) Reduce replacement costs
(3) Do not mark or score work
(4) Improve accuracy and efficiency

When **TALIDE-TIPPED** with Tungsten Carbide Wear Strips, *made in any length, shape or size.*



METAL CARBIDES CORP.

YOUNGSTOWN • OHIO

IMMERSION TYPE UL

"GUSHER"

PORTABLE PUMPING UNITS

For machines not originally equipped with pumps or reservoirs. Unit No. 1 (above) holds 4 gallons of coolant and a larger Unit No. 2 holds 11 gallons.

All that is needed is a distribution and return line to make the installation. Any "GUSHER" immersion type pump may be used.

Get the best when you buy pumps — get "GUSHER."

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The Ruthman Machinery Co.

538 E. FRONT ST. • CINCINNATI, OHIO

RED CAP FLEXIBLE SHAFT GRINDER
Cool, Comfortable Bakelite Handpiece
DRILLS, GRINDS
ROUTS, SAWS
Maximum Speed 12,500 r.p.m.
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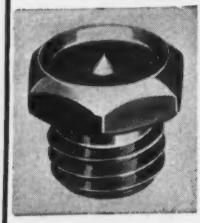
AGENTS WANTED.
THE LEA-NARD CO., 56 Warren St., N. Y.

Accurate Hole Transfer Made Easy With NIELSEN TRANSFER SCREWS



Simply insert in holes, invert, strike sharply and you have centers and drill circles perfectly located. Reduce time and eliminate spoilage of other methods. 7 sizes U.S.S. Inexpensive — Last for years.
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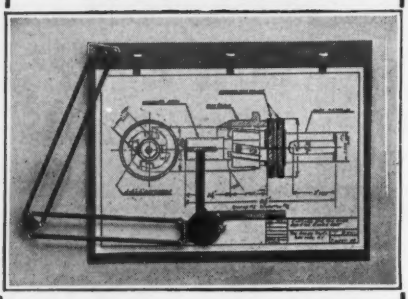
1863 Gardner Ave.
Berkley, Mich.

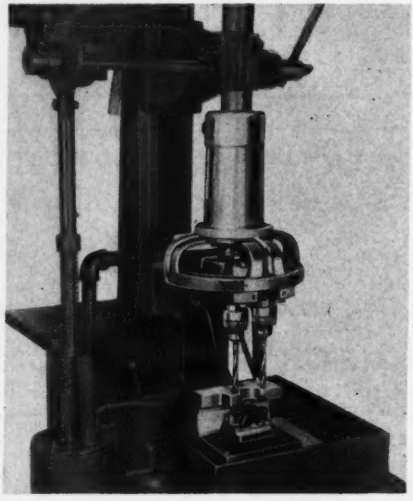
DRAFTO



Complete Drafting Units
For SHOP, HOME or SCHOOL
No. 10-H for 9" x 12" Drawings—$4.50
No. 20-H for 12" x 18" Drawings—$9.50
Postage prepaid when cash is sent with order. $1.00 must accompany all C. O. D. Orders.
Write for Catalogue on larger sizes.
THE DRAFTO CO. Cochranton, Penna.
Midwestern Branch:
1048 N. Lockwood Ave., Chicago, Ill.

Linderme Two-Spindle Adjustable Drill Head

The Linderme Machine & Tool Co., 12247 Coyle Ave., Detroit, Mich., announces a two-spindle, quick-set, adjustable drill head. Adjustment to the desired drill centers (⅞ to 6 in.) may be made by the simple turning of two hex



Linderme Two-Spindle Adjustable Drill Head

nuts, and when tightened will not shift or slip.

Recommended drill sizes are 0 to ½ in. The drill head is especially suitable for small drill presses and is also adaptable to larger presses. It can also be used for tapping operations.

Warner & Swasey No. 4 Ram Type Turret Lathe

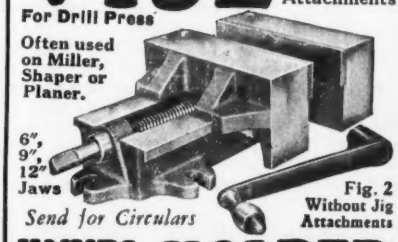
A new No. 4 Ram Type Turret Lathe has been announced by The Warner & Swasey Co., Cleveland, Ohio. Originally to have been introduced at the Machine Tool Show, the machine incorporates a host of improvements including a more rigid bed design, a head brake, and improved head lubrication. It has a bar capacity of 2 in., which is ¼ in. larger than the No. 4 machine it replaces, and has an 18⅛-in. chucking swing.

VISE

With and Without Jig Attachments

For Drill Press

Often used on Miller, Shaper or Planer.



6", 9", 12" Jaws

Fig. 2 Without Jig Attachments

Send for Circulars

KNURL HOLDER

For Turret Lathes

Operates like Screw Die.

Adjustable within capacity.

Straight Cut Knurls in Swivel Lugs Produce Standard Knurling.

Swivel Lugs

Shank made to suit turret

THE GRAHAM MFG. CO.

69 Willard Ave. PROVIDENCE, R. I.

LEAKPROOF AIR VALVE

Saves Air - Low Maintenance

Positive Air Control with Ease

MADE OF BAR BRASS and STAINLESS STEEL

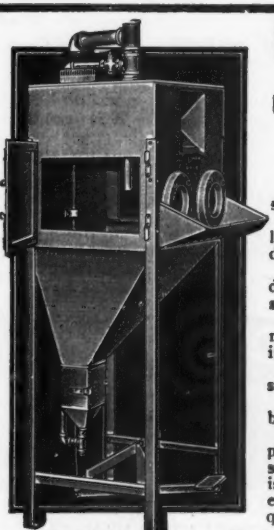
A Marvel of Simplicity

No packing glands. No external buttons or levers. Leakproof. Controls air with matchless efficiency from slight discharge to full blast with slight pressure between thumb and finger. All operating parts enclosed. THOUSANDS IN USE IN LEADING PLANTS. Order sample on 30 days approval.

Only Air-O-Chek Valves have the enclosed actuating lever connected to valve by ball and socket joint.

AIR-WAY PUMP & EQUIPMENT CO.

[illegible] WEST JACKSON BLVD. CHICAGO, ILLINOIS



REMOVE HARDENING SCALE

WITH

LEIMAN BROS. (PATENTED) Continuous Feed

SAND BLAST OUTFIT

It furnishes a modern, cleanly way of cleaning moulding sand from patterns and castings. Letters and designs stenciled.

Will replace the scratch brush for mat finishing and similar effects on all classes of goods—it will replace the use of disagreeable acids for this work.

Finishes may be fine, medium or coarse on all materials as desired—but, most important, it will always be uniform—no streaky, uneven results.

Any article to be plated should be sand blasted first—it will result in a more permanent plate, a quicker plate, and a saving of time in plating and a saving of current.

The most inexperienced person can operate it without instructions—the work cannot be spoiled.

Metal goods of every kind and description should be sand blasted to increase plating durability.

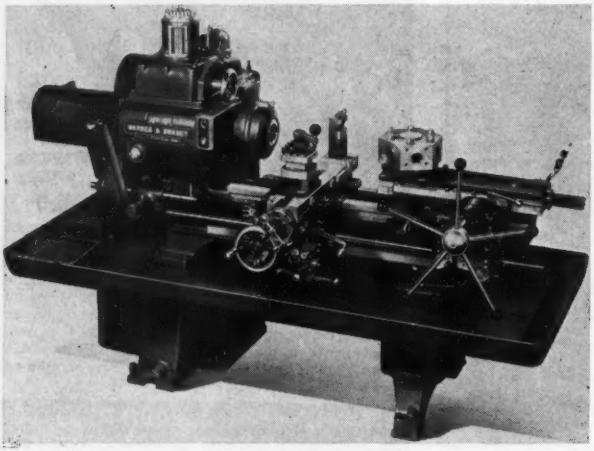
The sand blasting process makes a surface to which electro plate will adhere more securely and much more rapidly and so sand blasting saves time in plating, and improves your finish. This also applies to articles to be painted, sprayed, enameled or otherwise treated. Mat finishes of various degrees are quickly secured.

LEIMAN BROS., Inc. 4W-23 WALKER ST. NEW YORK CITY

MAKERS OF GOOD MACHINERY FOR 50 YEARS

Signalling the definite establishment of the pre-selector as an easily operated, cost-reducing, time-saving unit, the machine is equipped with the pre-selector head only. Heretofore the pre-selector head was available as optional equipment. With this unit, introduced by The Warner & Swasey Co. at the 1935 show, only one lever is required to shift the gears, instead of two, three, or four, and cutting operations are placed on a complete surface-feet-per-minute basis which materially simplifies operation of the lathe. To further ease shifting of gears, the location of the shifter fork is changed from the outside diameter of the gear teeth to a hub on the shaft.

To maintain accuracy during extreme cutting conditions the rigidity of the bed has been increased almost 30 per cent by a new design that features diagonal ribbing, similar to bridge truss bracing, instead of conventional box type ribbing. This construction also increases considerably the clearance space for chips as they fall into the pan, a matter of growing importance as the rate at which metal is removed is increased.

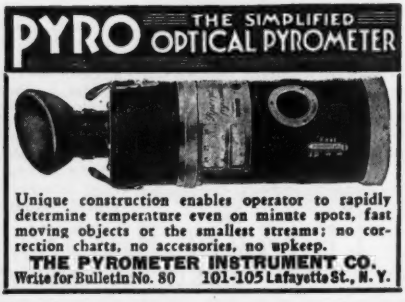


Warner & Swasey No. 4 Ram Type Turret Lathe

The head of the machine is lubricated by a forced feed system, with oil stored in a reservoir in the base of the machine. The spindle brake, another new feature, is an improved type that can be released after the spindle is stopped to allow positioning of chucks and fixtures.

The universal cross slide and hexagon turret offer maximum opportunity for combined cuts. There are six reversible power feeds, both cross and longitudinal, for the universal cross slide. All feeds increase uniformly to provide a proper range for all classes of work. The square turret indexes automatically and the large cross slide dial has widely spaced graduations for accurately measuring the depth of cut. A plunger oil pump on the cross slide thoroughly lubricates both the cross slide and bed bearings.

The hexagon turret is equipped with adjustable stops for automatically tripping the feed for each turret face, and


PYRO
THE SIMPLIFIED
OPTICAL PYROMETER
Unique construction enables operator to rapidly determine temperature even on minute spots, fast moving objects or the smallest streams; no correction charts, no accessories, no upkeep.
THE PYROMETER INSTRUMENT CO.
Write for Bulletin No. 80 101-105 Lafayette St., N. Y.

the turret may be indexed or "spun" in either direction to skip tool stations. Adjustable taper gibs at the side and top of the turret slide assure proper fit under all conditions. The hexagon turret revolves on an adjustable tapered roller bearing center stud. Hardened replaceable plates under the slide "wear-proof" the unit.

The motor and drive are completely enclosed in a cabinet leg directly under the head end of the machine. Doors on either side permit ready access to the motor. Multiple V-belt equipment is furnished standard.

Carbideborer W 101

The Giern & Anholtt Tool Co., 1312 Mt. Elliott Ave., Detroit, Mich., has placed on the market the Carbideborer W 101 illustrated herewith. The W 101 is built for a similar purpose as the smaller models, namely for high speed machining of long and accurate cylindrical semi and finish bores. The boring tools are guided in rotating pilot bushings (standard). This same principle was followed in earlier models and has proved very successful.

STEVENS ROTARY TABLES
STANDARD AND DIAL TYPES

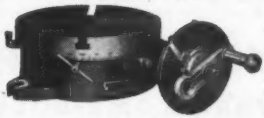
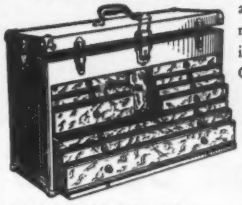


Table graduated for single degree reading. Precision and accuracy. Thirty years' experience designing circular attachments.

Write for circular.
Four sizes, two types of each.

JOHN B. STEVENS INC.
306 Hudson St. New York, N.Y.

TOOLS LAST LONGER



and are never "borrowed" when kept in genuine Gerstner Chests.

Write for *free catalog.*

GERSTNER Tool Chests
1239 COLUMBIA ST. DAYTON, OHIO

No more Breakdowns

caused by ordinary Set Screws working loose . . . . . .

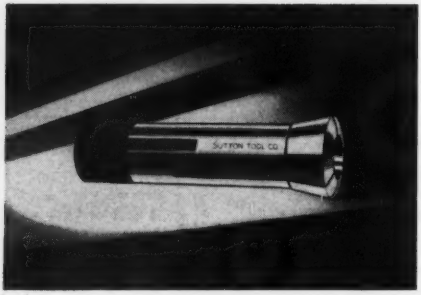
UNBRAKO
SELF-LOCKING Hollow Set Screws With the Knurled Points

Equip your machines with "Unbrako" Self-Lockers. Once set up they stay tight . . . no chance for them to vibrate loose . . . no further need for continual check-ups . . . far less maintenance work needed. These screws can readily be removed with the ordinary hex bar wrench and re-used over and over again with equal effectiveness. Write for details and samples.

Fig. 1645 Pats. Pending

STANDARD PRESSED STEEL CO.
JENKINTOWN, PENNA.
BRANCHES BOSTON DETROIT INDIANAPOLIS CHICAGO ST. LOUIS SAN FRANCISCO
Box 556

by SPRING TEMPER
with strong come-back



Sutton Collets for Lathes and Milling Machines

MADE from specially selected alloy steel. Expertly heat-treated to correct spring temper to resist wear and give a grip with a strong come-back. . . . Threads chased with single-point tool to insure perfect alignment with draw bar. . . . Precision ground to insure accuracy of taper and concentricity of hole.

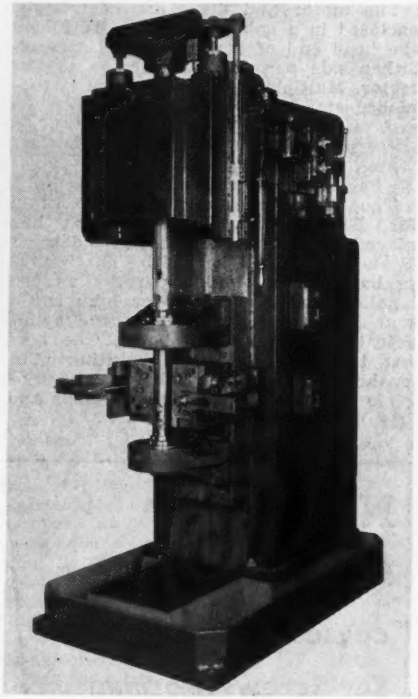
Send for Sutton Catalog listing Collets for all makes of lathes and milling machines

SUTTON TOOL COMPANY
2895 W. Grand Blvd., Detroit, Mich.

Represented in Canada by
HI-SPEED TOOLS, Ltd., Galt, Ont.

Sutton DIAMOND-GRIP Collets, Fingers and other accessories for screw machines

The W 101 is of welded steel construction with the exception of the base plate which is of cast iron. The spindle is 3⅜ in. diameter and is driven by an hour glass worm wheel. The worm is driven by a V-belt step pulley. Speed ranges are from 100 to 550 revolutions per minute. The spindle travel is 20 in. and is

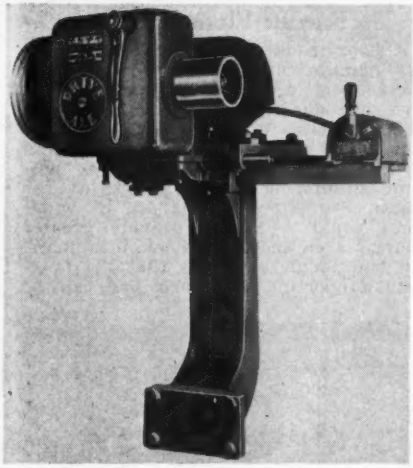


Carbideborer W 101

hydraulic. The diameter of bores ranges from 2 to 5½ in. The illustration shows the Carbideborer W 101 with a fixture in position.

Drive-All Motorizing Unit

To eliminate the use of belting and make possible a variety of speeds without necessity of shifting belts, Drive-All Manufacturing Co., 3410 Conner Ave., Detroit, Mich., has developed the "Drive-All" Motorizing Unit illustrated herewith. The Drive-All Unit is sup-



Drive-All Motorizing Unit

plied with a built-in four-speed or three-speed transmission, a single speed shift lever making it possible for the operator to choose any one of either three or four speeds. When a two-speed motor is used, either six or eight speeds are available.

The Drive-All Unit is compact and sturdy, and can easily be applied to any modern machine tool. Power from 1 to 5 h.p. can be supplied, the motor rails being adjustable to accommodate any size of motor. Adjustment is easily made for belt tension and the belt may be guarded. The transmission gears are of strong design and, together with other rotating parts, are mounted on ball bearings. An oil bath provides proper gear lubrication.

TROYKE ROTARY TABLES

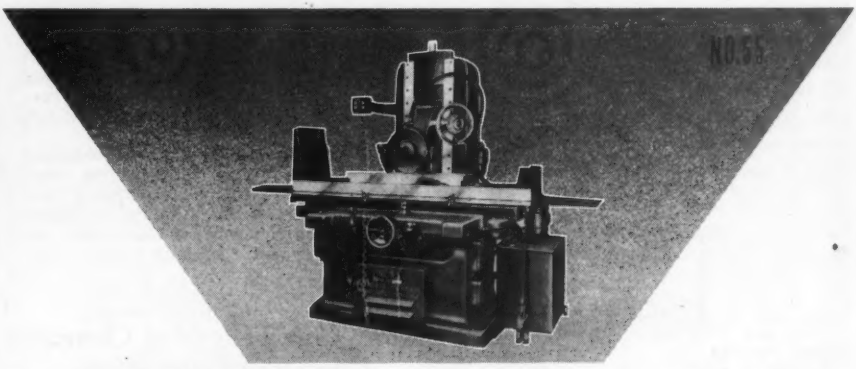
Moderately Priced.

9", 12", 15", 18", 21", 25"

With or Without Dividing Plates.
Ask your dealer and write us.

ALFRED A. TROYKE

219 E. Second St. Cincinnati, Ohio



● This "GRAND RAPIDS" Hydraulic Feed Surface Grinder was designed for *you*—to earn greater grinding profits in your plant. Table speeds up to 150 ft. p.m. with minimum power and wheel cost. Sizes from 6" x 18" to 30" x 144".

Write for complete catalog.

GALLMEYER & LIVINGSTON, CO.

Here's what to do the next time you need a work-bench

WRITE...
PHONE...
WIRE for a
"HALLOWELL" STEEL WORK-BENCH

Over 1300 "Hallowell" Bench combinations for you to choose from. Shipment from stock eliminates all hold-ups. Surprisingly low in cost. Get just the bench you need, quickly, by specifying "Hallowell." Send for our catalog. It describes the complete line. Tells about smooth steel tops, rigid welded construction, easy movability. The book is free.

Fig. 732
Pat'd. and
Pats. Pending
Drawer is extra.

STANDARD PRESSED STEEL CO.
JENKINTOWN, PENNA.

Boston
Detroit
Indianapolis
Box 556
Chicago
St. Louis
San Francisco

Barrett Floor Truck

A floor truck which, it is claimed by the manufacturer, has several unique design and construction features, has been introduced by the Barrett-Cravens Company, 3255 W. 30th St., Chicago, Ill. The truck has a hardwood deck bound with high carbon steel angles to prevent splintering and cracking at the edges. Semi-steel wheels are of wider than usual width to provide greater bearing area and for protection to floors. An additional feature is that the brackets supporting the push bar can be

Barrett Floor Truck

readily removed to permit installation of a box, rack, or shelf-type substructure should conversion become desirable.

The truck is ruggedly reinforced, the front wheels being particularly well mounted to provide easy turning and withstand the stresses of overloading. The load capacity has also been increased as a result of this type of construction.

Morse Interchangeable, Channel-Lubricated Roller Chain

A channel lubricated roller chain, which conforms to American Standard dimensions and is completely interchangeable with all other standard roller chains, has recently been announced by Morse Chain Company, Ithaca, N. Y. A particularly ingenious design retains the self-lubricating features of Morse Roller Chain while adding this complete interchangeability.

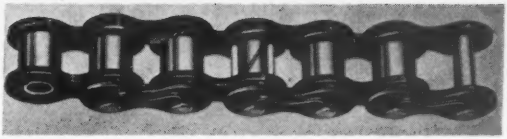
In this round-pin Morse roller chain,

diagonal channels are rolled into the stock from which the bushing is formed. When the joint is assembled, these channels appear as spiral grooves and extend through the side plates of the bushing link.

Oil on the rollers quickly finds its way to the bushing surfaces. The channels act not only as reservoirs but as paths for the flow of oil through the side plates and down to the pins, where the lubricant is seized and spread by capillary action in a protective film over the entire contact surfaces of pins and bushings.

Action is such that, in conjunction with the turning motion of the rollers, the channels become in effect small pumps, literally forcing oil to all wearing parts of the chain. Service life will be increased appreciably by the positive lubrication of the parts which fail first in conventional chains.

The revolutionary construction of channel-lubricated Morse Roller Chain has made possible several other noteworthy improvements. Rollers hardened and ground, turned out of solid bar stock alloy steel to attain greater accuracy and wearing strength. The cross section of the side plates has been increased, giving improved Morse Roller Chain at least the strength of conven-



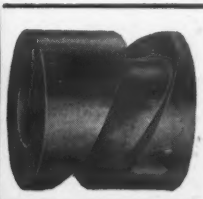
Section of Morse Interchangeable Channel-Lubricated Roller Chain

CAMS

All sizes — shapes

...

Precision work on special machines, parts, jigs, tools, etc.



VARICK MACHINE & TOOL WORKS, INC.

306 HUDSON ST. • NEW YORK

MODERN BOX STORAGE SPEEDS PARTS HANDLING

Small parts and loose materials, stored in high-piled boxes, are instantly accessible in modern STACKRACK-equipped shops. In sizes to fit your present boxes or pans, individual steel units interlock to form storage racks of any size, shape or capacity. Boxes slide in them like drawers in a desk—their contents are always within easy reach.

Write to Stackbin Corp., 53 Troy St., Providence, R.I., for complete details and prices—see how patented STACKRACKS can speed up handling and reduce unproductive box-shifting.

STACKRACKS

"STACKED AND STILL ACCESSIBLE"

tional "heavy duty" sizes. The Morse patented spring lock cotter, which no amount of vibration can loosen or chew, is retained and is optional at no extra cost.

Single, double, triple, and quadruple widths, all standard pitches, and standard stock attachments are available in the improved Morse Roller Chain. Stocks are carried in key cities throughout the country.

Mallsander

The Mall Tool Company, 7766 S. Chicago Ave., Chicago, Ill., has introduced a heavy duty sander to be known as the "Mallsander." The tool is streamlined, light in weight, and perfectly balanced for easy operation with right or left hand. Standard equipment includes 15 ft. of cord and plug, 7-in. backing pad and abrasive, and a special spindle lock that fastens the spindle when removing or applying the abrasive disc. This feature eliminates the use of loose wrenches that may easily become lost or misplaced.

The Mallsander has a high torque, high powered, cool running motor and spiral bevel chrome nickel alloy steel gears, completely enclosed in extra strong light-weight housings.

Mallsander

Chart of Super Carbide-Tipped Masonry Drills

This chart, now being distributed by Super Tool Company, 21650 Hoover Rd., Detroit, Mich., lists the carbide-tipped masonry drills made by this firm, giv-

SHELDON Back Geared Screw Cutting PRECISION LATHES

The Sheldon Line provides Lathes of 10", 11" and 12" of all standard types and drives, each more tool for the money. Be sure to see the Sheldon before you buy.

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ing the stock number, size, length, shank diameter, and price, and indicates the drill to be used with any one of 36 different makes and types of shields or anchors. This chart should be especially useful to plant engineers and maintenance men. Copy free to any plant executive upon request.

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The combination of two well-known items improves parts storage and handling methods by eliminating the time-wasting transfer of small parts and materials from one container to another. With this combination, parts and materials are taken from one department to another in the same bins.

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Stackbins and Stackracks are made by Stackbin Corp., 46 Troy St., Providence, Rhode Island.

Esso "Rust-Ban" Protective Coatings. An illustrated pamphlet describing a complete line of rust preventives recently developed and placed on the market under the name of "Rust-Ban" has been issued by the Standard Oil Co. of New Jersey, 26 Broadway, New York, N. Y. The pamphlet is divided into sev-

NEW
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At Griffin Mfg. Co., Erie, Pa., manufacturers of brackets, hinges, etc., this piece of 1½" O.H. Tool Steel was shaped on the DoAll in 21 minutes. Note there is both internal and external cutting. Formerly the same job required 7 hours. DoAll saved more than 6½ hours on this one job. Figure out what it would save you in a single day.

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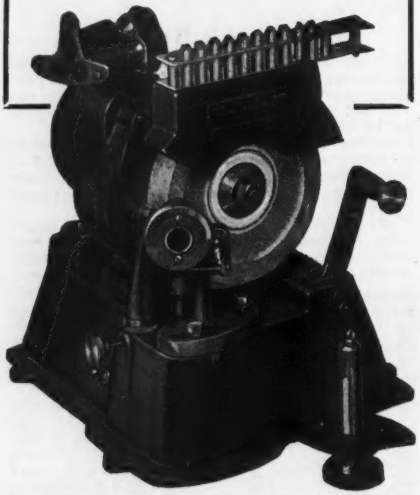

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Write for Bulletin No. 121.

BLACK DIAMOND
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eral sections which discuss in detail non-drying coatings, hard-drying transparent coatings, hard-drying aluminum coatings, and miscellaneous coatings, and give proper Rust-Ban recommendation for each type coating. Copy free upon request.

New Books

Metallurgy. By Carl G. Johnson, Asst. Professor of Mechanical Engineering at Worcester Polytechnic Institute, and R. S. Dean, B.S., M.S., Met. E., Chief Chemist, L. Gregg, B.S., Battele Memorial Institute. Published by American Technical Society, Drexel Ave. and 58th St., Chicago, Ill. 149 pages, 82 illustrations, and several tables. Bound in water and vermin-proof binding. Price, $1.50.

This book presents in a clear and practical manner details of the manufacture and behavior of the many metals and alloys that are used today. It is labeled as a "how-to-do-it" book, the text being written to tell how to select metals for the purpose for which they are best suited, how to make tensile tests, how to use hardness testers, how to make electric, magnetic and chemical tests, how to use the microscope, how to measure temperatures in metallurgical work, how iron and steel castings are made, how metal alloys are produced, how the various non-ferrous metals are formed, how the crystal patterns are formed in metals, how to read a time-temperature curve, how to read the iron-carbon diagram, how to use the S.A.E. steel specifications, how the technic of powder metallurgy is carried out, and explains the "how" of many other items and details connected with the metallurgist's work.

The book is written in an easy-to-read manner and will be found especially useful as a beginning text in the teaching of metallurgy.

Oxy-Acetylene Welding for Beginners. By J. W. Giachino, M.A. Published by the Manual Arts Press, Peoria, Ill. 96 pages, 6 x 9 in. in size, 71 illustrations. Price, $1.48.

The growing importance of welding in the industrial field is opening opportunities for employment to those who have been especially trained for this type of work, and many educational institutions are now offering training to the boys and young men who wish

to prepare for this vocation. The teaching of welding can be simplified and at the same time be made more comprehensive if a well-organized plan of procedure is followed and it is the purpose of this book to provide the teachers and students of welding with such a plan.

Beginning with a discussion of the nature of welding, the safety rules to be observed, and an analysis of the welding apparatus, the student is given successively instructions in the manipulation of the welding rod, welding a lap joint, welding a T-joint, horizontal welding, vertical welding, backward welding, identification of metals, and so on through to the construction of metal boxes, flower pot holders, andirons, work benches, and other lessons in fabrication. A series of questions at the end of each chapter will aid in reviewing the student's knowledge of the subject up to that point.

Diesel Engines — Theory and Design. By Howard E. Degler, Prof. of Mechanical Engineering, University of Texas. 270 pages, 62 illustrations, and 17 tables. Water-proof binding. Published by American Technical Society, Drexel Ave. at 58th St., Chicago, Ill.

This book is a practical text on the efficiency of internal-combustion engines; thermo-dynamics of internal-combustion cycles; fuels, combustion, and combustion chambers; testing and performance; principles of engine design and design of major engine parts. It is written in an interesting manner by a man who has had years of practical and teaching experience, and is intended primarily for the use of students, designers, and draftsmen. The book is written with the assumption that the reader has a knowledge of the principles of mechanics, and a general acquaintance with the mechanism of some form of an internal-combustion engine such as used in the automobile, airplane, or tractor. On this basis the material is developed from the first principles of Diesel-engine theory, application, performance, and design in a manner that should enable the reader to recognize the existence of correlated design problems to be considered later in the book.

The book is a splendid volume for teaching beginning Diesel theory and design, especially in evening school

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classes, and is also valuable for self-study and reference work.

Trade Literature

Walker A. C. and D. C. Demagnetizers. This four-page folder, now being distributed by the O. S. Walker Co., Inc., Worcester, Mass., describes and illustrates the Walker direct current demagnetizer of the belt driven and direct connected types, and the Walker alternating current demagnetizer of the plain portable and pistol grip portable types. The operation of A. C. and D. C. demagnetizers is discussed in detail.

The folder also includes illustrations of Walker magnetic chucks of the rectangular, swiveling and rotary types. Ask for Circular K7 when writing for free copy.

Farquhar Hydraulic Presses. This 24-page loose leaf catalog now being issued by A. B. Farquhar Co., Ltd., 404 Duke St., York, Pa., illustrates and describes the various types of hydraulic presses made by this firm. The machines presented include open gap hydraulic presses, a hydraulic crimping press, a hydraulic scarfing press, a hydraulic sectional flanging press, a hydraulic joggling press, a hydraulic laboratory press, and many other types. Each machine is illustrated together with specifications. One section is devoted to a partial listing of hydraulic presses and machinery applications.

Copy free upon request to any mechanical executive.

Bantam Rotary Air Grinder. The Independent Pneumatic Tool Company, 600 W. Jackson Blvd., Chicago, Ill., has placed on the market a 5½-in., 17-oz. rotary air grinder. For complete data and specifications of this tool they have issued a circular which gives the uses for the Bantam Rotary Air Grinder and depicts them in many interesting close-up action photos. All grinding wheels and accessories available are pictured and priced to give an idea of the versatility of the tool. The circular is colorful and instructive and gives the pertinent information in an easy-to-read style. It can be obtained by writing to the Independent Pneumatic Tool Company and requesting Circular P20.

Did You Know That—

The combinations of grits, grades, bonds, and structures in grinding wheels are practically without limit? See page 94.

Steel parts can be hardened by a process that leaves a bright, clean, hard surface with no soft skin? See page 144.

Water serves as a lubricant on surfaces that have been properly treated? See page 137.

Ball bearings can be had as small as 0.060 inch diameter? See page 102.

By intelligent planning, steam for steam hammers can be produced without cost? See page 86.

Double figure-eight oil grooves can be cut in bushings at the rate of 500 pieces per hour? See page 27.

It is easy to minimize glare and obtain good light diffusion throughout your plant? See page 70.

A mosquito walking on a two-inch shaft will deflect the shaft? See page 76.

Weakness in a part caused by a drilled hole can be remedied by drilling more holes? See page 78.

The cost of blanking dies can be reduced considerably by the use of welding? See page 118.

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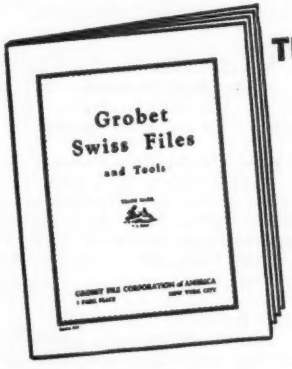
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To obtain copies of the catalogs listed here, indicate on the coupon the number of the item in which you are interested and mail as directed.

1. **Electric Etcher**
Wm. Brewster Co., Inc., 40 Church St., New York, N. Y., has released a circular illustrating and describing the Etchograph for marking iron and steel tools, test pieces, hardened parts, etc.

2. **Profile Grinder**
The new Multi-Purpose Head Boyar-Schultz Heavy Duty Profile Grinder No. 2 is illustrated and detailed in a new bulletin just released by Boyar-Schultz Corporation, 2120 Walnut St., Chicago, Illinois.

3. **Foot-Control Switches**
A new folder has just been released by The Walton Co., 98 Allyn St., Hartford, Conn., which illustrates and describes Leeds Foot-Control Switches.

4. **Gears**
A new catalog featuring gears for every purpose has been released by Illinois Gear and Machine Co., 2106 N. Natchez Ave., Chicago, Illinois.

5. **Socket Set Screws**
Safety Socket Screw Corp., 4440-46 N. Knox Ave., Chicago, Ill., has issued a catalog covering Safety Products including socket set screws, head cap screws, pipe plugs, headless set screws, socket head stripper bolts, socket screw wrenches, milled studs, etc.

6. **Air Heater**
A new bulletin featuring Despatch Gas Fired Controlled Combustion Direct Air Heaters has just been published by Despatch Oven Company, Minneapolis, Minnesota.

7. **High Speed Grinders**
Themac High Speed Portable Electric Precision Grinders are illustrated and described in a new circular released by The McGonegal Mfg. Co., East Rutherford, N. J.

8. **Drill Chucks**
Folder 100, released by Scully-Jones & Co., 1913 S. Rockwell St., Chicago, Ill., illustrates, describes and lists prices on "Feed as you need" Chucks.

9. **Expansion Reamer**
Staples Tool & Engineering Co., Cincinnati, Ohio, has issued a new folder which illustrates and describes the Staples Carboloy tipped expansion reamer.

10. **Spring Data Sheet**
Helpful data sheet featuring stock springs in 234 sizes ranging in length from ¼" to 24"; in diameter from ⅛" to 4"; in wire size from .016 to .500. Hardware Products Co., 105 Richmond St., Boston, Mass.

11. **Universal Vise**
Complete details on the Wesson Universal Vise are outlined in illustrated folder released by Wesson Co., 1050 Mt. Elliott, Detroit, Michigan.

12. **Shop Boxes**
Lyon Metal Products, Incorporated, 1307 River St., Aurora, Ill., has available bulletin featuring Lyon's complete line of shop boxes.

13. **Hydraulic Production Presses**
Uses, specifications and engineering data for Farquhar Hydraulic Production Presses are included in a 24-page bulletin issued by A. B. Farquhar Co., Ltd., 404 Duke St., York, Pennsylvania.

14. **4-Speed Drive**
Details on the Schultes 4-Speed Drive for milling machines, shapers, lathes, drill presses, planers, punch presses, slotters, etc., are contained in bulletin now available. Westlof Tool & Die Co., 430 Bellevue Ave., Detroit, Michigan.

15. **Shim Application Chart**
This new chart, just released, contains a comprehensive survey of proved applications for laminated shims and shim stock. Laminated Shim Company, Inc., 21-86 Forty-fourth Ave., Long Island City, New York, N. Y.

16. **Vertical Turret Lathe**
A new 24-page catalog has just been published by The Bullard Co., Bridgeport, Conn., which illustrates and describes the Bullard Spiral Drive Type Vertical Turret Lathe.

17. **Motor Lubrication**
A new three-color bulletin describing U. S. Lubriflush system of motor lubrication has just been issued by U. S. Electrical Motors Inc., Los Angeles, Cal.

18. **Machining Zinc Alloy Die Castings**
The New Jersey Zinc Co., 160 Front St., New York, N. Y., has released a new booklet titled "Practice in Machining Zinc Alloy Die Castings."

19. **Woodruff Type Keys and Cutters**
Catalog V-111, issued by The Whitney Chain and Mfg. Co., Hartford, Conn., completely details Whitney Woodruff Type Keys and Cutters.

20. **Coated Abrasive Papers and Cloths**
A useful catalog and price list chuck full of useful information on coated abrasive papers and cloths has just been issued by Abrasive Products, Inc., South Braintree, Mass.

21. **Lathes**
New bulletin No. 393, published by Rockford Machine Tool Co., Rockford, Ill., gives specifications and full descriptions of the Economy Lathe Line.

22. **Collet Chucks**
A new bulletin featuring Universal Collet Chucks has been released by Universal Engineering Co., Frankenmuth, Michigan.

23. **Factory Equipment**
The Cleveland Wire Spring Co., Cleveland, Ohio, has available new Catalog No. 33, featuring Steel Shop Boxes, shop kegs and pails, annealing pans, drying pans, lathe pans, waste cans, stools, steel tool and supply racks, shelving, coiled wire and flat springs and formed wire specialties.

24. **Stainless Steel Stock List**
This is a handy 16-page Stocklist SS100 showing size of Rezistal sheets, bars and welding rods carried in Crucible's Mills and Branches. Crucible Steel Co. of America, 405 Lexington Ave., New York, N. Y.

25. **Wire Feed Screw Machines**
An elaborate 32-page catalog detailing Wire Feed Screw Machines has been issued by Brown & Sharpe Mfg. Co., Providence, R. I.

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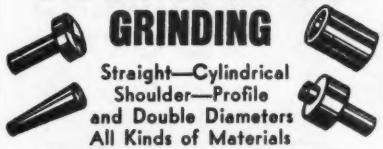

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"Ideal" Wire Strippers. Various types of cable and wire strippers and cutters are described and illustrated in a six-page folder now being issued by Ideal Commutator Dresser Co., 1031 Park Ave., Sycamore, Ill. The models shown are: Simplex Lever Type No. 11 Cable and Wire Stripper, Rotary Type No. 8 Motor Driven Wire Stripper, Type No. 7 E-Z Foot-Operated Stripper, E-Z Standard and Automatic Strippers, Cable Ripper Type No. 4, Wire Skinner Type No. 6, Wire Skinner and Straightener Type No. 5, Simplex Type No. 12 Foot-Operated Cable and Wire Cutter, Simplex Bench Type No. 10 Wire Stripper, and Brush Type Motor Driven Wire Stripper. Copy free upon request.

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JAKE'S WAR DEPARTMENT IS BROADCASTIN' ANOTHER ULTIMATUM! IF HE EVER SAYS ANYTHING BUT "YES" HE'LL GET SLAUGHTERED!
AND IF HE HITS TH' BOSS FOR A RAISE TODAY AFTER GUMMIN' UP THAT MILLIN' MACHINE JOB YESTERDAY, HE'LL GET RAISED OUT TH' DOOR. POOR JAKE IS ALWAYS IN TH' MIDDLE!
BE IT EVER SO HUMILIATING, THERE'S NO PLACE LIKE HOME!
Bert Wesser

Cincinnati Single Ram Vertical Hydro-Broach Machine. The Cincinnati Milling Machine Co., Cincinnati, Ohio, has published Bulletin M-834 which describes and illustrates the Cincinnati Single Ram Vertical Hydro-Broach Machine. A dimensional drawing of the complete unit together with drawings of the various parts of the machine are included in the bulletin. A complete table of specifications is also given. Copy free upon request.

Whitman & Barnes Catalog No. 96. Complete illustrations and listings of all types of drills, reamers, screw extractors, counterbores, interchangeable punches, and so on, manufactured by Whitman & Barnes, 2108 W. Fort St., Detroit, Mich., are contained in Catalog No. 96 now being distributed by this firm. Listings of affiliated tools are grouped together to enable the reader to find quickly the information desired. Copy free upon request.

La Salle 1020-90 Carburizing Steel. Information such as tables and data regarding the carburizing and physical properties, uses, and so on, of La Salle 1020-90 — a non-alloy carburizing steel for piston pins, clutch pins, shackle bolts, idler gear shafts, pinions, gears, and so on—is contained in a four-page bulletin now being distributed by the La Salle Steel Company, Chicago, Ill. Copy free upon request.

South Bend Lathe Catalog. The South Bend Lathe Works, 370 E. Madison St., South Bend, Ind., has issued Catalog 100 which is said to be the most complete lathe catalog ever published. The catalog contains 112 pages with over 250 illustrations and shows 75 different sizes and types of South Bend Back-Geared Screw Cutting Lathes for production manufacturing, tool room, and general shop work.

Sizes of lathes illustrated are 9, 11, 13, 14½, 16, and 16-24-in. swing. Each size is shown in several different models with motor drive and countershaft drive. New items shown for the first time in this catalog include a 1-In. Collet Capacity Precision Bench Lathe mounted on a welded steel bench, and a complete line of 14½-in. swing lathes.

A copy of Catalog 100 will be mailed on request to any plant executive mentioning this magazine.

"Simple Facts About Synchronous Motors" is the title of a booklet which describes synchronous motors in language the layman can understand, telling how to select the proper synchronous unit for the application, and showing the advantages of the synchronous motor. The booklet is being distributed by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa. In order to simplify explanations, everyday figures are used. Switching from induction to synchronous motor operation is explained as "like a man boarding a moving train, for the speed of the rotor must be brought up close to the speed of the rotating electrical field of the stator. Once 'pulled into step,' both continue at the same speed." Application data, including the more important synchronous motor applications and their typical torque requirements, are listed for various installations.

Copies of this booklet, B-2164, are available upon request.

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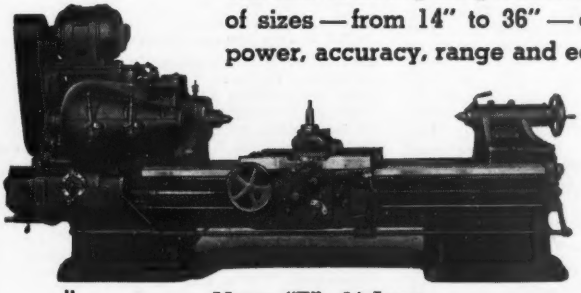

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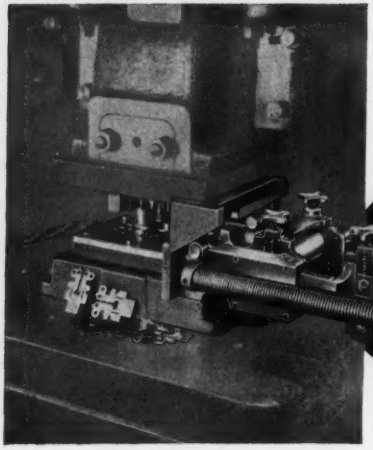

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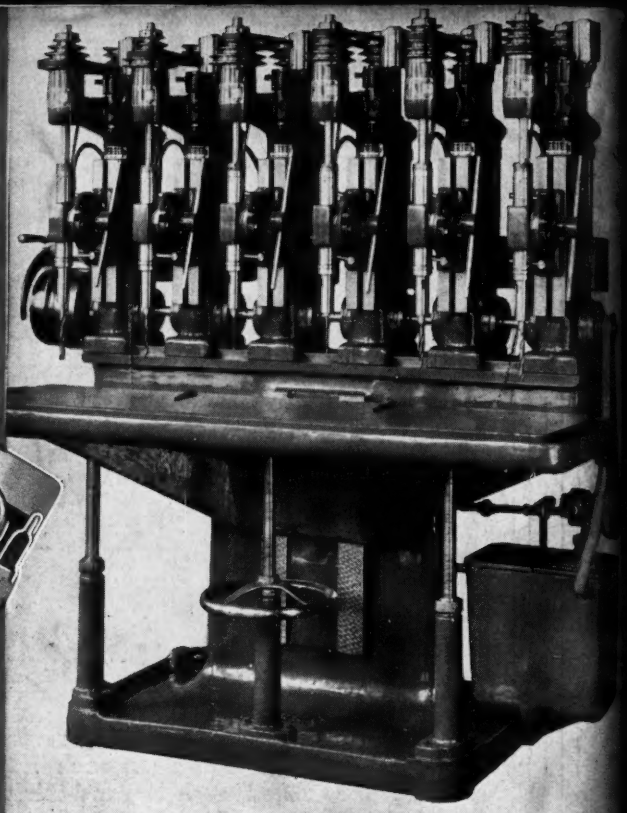

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